Gender, the Environment, Energy Technologies and Climate Change

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Draft 4 of 16 December 2011

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1. Overview of Gender, the Environment and Energy Technologies

1.1 Gender and Gender Equality

Environmental degradation, energy poverty and climate change are challenging issues which Asia and the Pacific region are facing nowadays. Livelihoods of many people are affected dramatically from these problems, and some face particular vulnerabilities. Even though the issues of environment, energy provision and climate change influence every human being’s lives, they have different consequences for different persons, and some of these differences are associated to the gender of persons. The ways women and men react and suffer from these issues are not the same. Therefore, the term ‘gender’ must be considered when we investigate issues of environment and energy technologies.

UNESCO (2000) defines ‘gender’ as; “the social differences and relations between men and women which are learned, vary widely among societies and cultures, and change over time. The term gender does not replace the term sex, which refers exclusively to biological differences between men and women. For example, statistical data are broken down by sex. The term gender is used to analyse the roles, responsibilities, constraints, opportunities and needs of women and men in all areas and in any given social context. Gender roles are learned behaviours in a given society, community or other social group. They condition activities, tasks and responsibilities that are perceived as male or female. Gender roles are affected by age, class, race, ethnicity and religion, and by the geographical, economic and political environment.”

Gender is essentially a combination of stereotypes – beliefs, positive or negative, that people hold about a group and its members. Gender stereotypes are apparent in many aspects of life, including personal traits, behaviours, occupations, hobbies, appearance, family functions, communication, sport activities, and preferences for almost anything. Gender stereotypes shape people’s behaviours, expectations and roles; conversely, roles can become stereotypes (Huntoon, 2008). It is also important to note that sex and gender are not separate categories. They are inextricably bound with each other. The assumptions or stereotypes of gender roles are partly influenced by physical attributes of men and women.

Gender Division of Labour

Stereotypically, women are perceived as emotional provider and as more delicate and caring than men. Moreover, women biologically contribute to reproduction (becoming pregnant and taking care of children). Thus, they are assumed to be appropriate for reproductive work and caring tasks which often imposes other household chores on them. Apart from taking care of children, women have to cook and clean which means that they have to fetch fuel and water to complete these tasks.

With their greater physical strength in general, men are socially assigned as the breadwinner of the family thus their activities involve more in economic and public sphere. It is an overstatement to say that this pattern of gender roles is still strictly reinforced in societies. The fact is that the traditional gender division of labour has more or less transformed throughout the history. Women are becoming more involved in the formal economic sector than in the past and gain more voice and participation in public decision making bodies. Despite such progress, many women (especially in developing countries) still suffer from persisting gender stereotypes, discrimination
and inequality. Despite increasing global female employment rates, women still suffer from unequal treatment and received unequal work benefits in many countries. Moreover, more women continue to be subject to employment in the informal sector, often receiving substandard wages, and doing strenuous work that is neither monitored by governments nor protected by labour legislations. Women’s lack of employment opportunity in the formal sector in some countries\(^1\) leads to poverty among them (UNESCAP 2006, p.6). Although women’s involvement in the labour market has increased substantially, there appears to be no notable increase in men’s partaking of unpaid work, such as care-giving. This has somewhat limited women’s choices of employment, resulting in a large portion of women taking on part-time work, which entails wage-penalties and restricted pensions. Gender inequalities, attributed to societal and cultural constraints and discrimination, have resulted in women having limited access to resources that will improve their capacity and labour productivity, such as information and training (Department of Economic and Social Affairs, Division for the Advancement of Women 2009, p. vii). Despite women’s increasing participation in political and formal economic sphere, women are still far behind from their male counterparts in gaining and achieving good quality of life in general.

As mentioned, prevailing gender roles continue to place most men and women into different responsibilities and social positions. In many countries of Asia and the Pacific, women are traditionally assumed to be responsible in providing food, water and fuel for their household. Women in Asia and the Pacific also take part in the economic sphere; they also work in the agricultural sector or work outside home. In Noza, Pakistan, an average working day for a woman during the productive season can be up to 17 hours long (Dankelman, 2004). In addition to working in the field, women still have to carry out domestic labour such as nursing children, cooking and cleaning when they get home.

In terms of relationships with the environment, the responsibilities concerning management and conservation of natural resources between men and women vary amongst regions. Women participate considerably in agricultural sector. On average women comprise 43% of agricultural labour force in developing countries (FAO, 2011). In countries such as in Nepal, India and Bangladesh, women’s proportion in agriculture is as high as 60% (FAO, 2010). Despite women’s participation in agricultural labour force, many continue to encounter discrimination with regard to access to natural resources and property, with statistics indicating that around 20% of the world’s landowners are women.\(^2\) This in turn affects women’s agricultural productivity and their ability to ensure thereby contributing to food security, limitations of which are increasingly associated with poverty.

Reforms have been initiated by legislations enacted to protect women’s property

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\(^1\) UNESCAP’s statistics on women’s employment in Asia suggests that during the latter part of the 1990s, the share of women’s participation in the informal sector as a percentage of non-agricultural employment was higher than that of men in India, the Philippines and Indonesia. In Thailand, women’s participation in informal sector was 54% compared with 49% for men. Within the informal sector, a larger proportion of women than men were self employed in India, Indonesia, the Philippines and Thailand. In Indonesia, 70% of women employed in the informal sector were self-employed, as compared with 59% of men (UNESCAP 2006, p.6).

rights, but these reforms are often obstructed by socio-cultural norms, and women’s
genral lack of legal knowledge concerning their rights. In essence, development
strategies must focus on generating formal employment for women, ensuring their
access to property rights and resources, financial services, and social security
measures. By studying the link between gender and the environment (Rai et al.,
2010), it becomes clear that the environment is a universal concern for all of
humankind.

With lack of access to resources, economic freedom, political and social participation
and access to proper education and health care; women are in the most vulnerable
position with respect to energy poverty and environmental problems. Pre-existing
gender inequality is a condition that makes women more vulnerable to deterioration of
environment and climate change. For example, women often lack economic resources
which are crucial for coping with degradation of agricultural land as a result of
environmental problems or climate change. Women also have less ability than men to
adapt with the effects of climate change because of poverty and lack of political and
economic opportunities. In terms of energy, gender inequality deprives women and
girl’s ability to access to proper energy sources which is important for their
livelihoods.

Gender Equality

To achieve gender equality, it does not mean that men and women have to become the
same, but that their rights, responsibilities and opportunities will not depend on
whether they are born male or female. Gender equality means fairness of treatment for
men and women, according to their respective needs. This may include equal
treatment that is different but which is considered equivalent in terms of rights,
benefits, obligations and opportunities (ILO, 2000).

Since the issue of gender equality is frequently discussed in terms of women’s
disadvantaged position, it is not surprising that the term ‘gender issues’ sometimes are
understood as ‘women’s issues’. However, the matter of gender equality must be
addressed in terms of the relationship between men and women, including their
relative position and power in society. Therefore, in attempt to achieve gender
equality, it is important that men are included in the process. As Chowdhury and
Patnaik (2010) point out that both genders are born together and continue to coexist.
They cannot live without each other. And in order to successfully promote social
cohesion, every member of the society must be treated equally regardless of their
caste, class, gender, religion and other social categories. Mutual understanding
between men and women is important because it can lead to mutual support and social
development.

Men are generally in positions of advantage and privilege over women; they hold
majority of economic resources, political power, cultural authority and means of
coercion. Connell (2005) suggests that, the power and resources that men have over
women are required to implement women’s claim for justice. Hence, men and boys
are gatekeepers for gender equality; they hold the key to open the gate to allow major
gender-equality reform. Also, it is equally important to note that not all men enjoy
privileged positions. While there are many men sitting in executive positions or
benefiting from accumulated wealth, numbers of boys and men, especially in
developing countries, face extreme poverty and male racial and ethnic minorities face
discrimination. Some men are more prone to dangerous lifestyles as well; such as
violence, alcohol and other work-related risks (for example, see chapter 3.6).
Connell (2005) gives interesting reasons why men and boys support gender equality. First, social relationship of men and boys with their female counterparts such as wives, partners, mothers, aunts, daughters, friends, colleagues, neighbors and so on. The good quality of this social relationship affects men’s livelihood. Second, men may want to avoid the dangerous effects that come from their gender roles. They disproportionately experience premature death from accident, homicide and suicide; they also have more work-related injuries and higher level of drug abuse. These are the costs of being considered to be “tough” and dominant in a masculine way. The expected role of breadwinner pressures men to take responsibility for their family and to compete in the workplace. Sometimes when men are unemployed or lose power and economic assets (as in the case of natural disasters; see chapter 4.3), they have to deal with tension or psychological distress if they cannot fulfill the role of breadwinner. Third, men may support gender change because it is beneficial to their community. For example, in society with poverty and underemployment, women might have chance to earn income alongside men. Gender division of labour may become more flexible in a household that experiences financial instability; therefore, women’s earnings are just as necessary as men’s. Consequently, women in some countries have gained more recognition in the public sphere and more independence, including in fields related to the energy sector. Fourthly, men may support gender reform because gender equality follows from their political or ethical principles such as religious, socialist or broad democratic beliefs. The need to consider men’s roles in achieving gender equality is also recognised in the international arena. Several international instruments which promote gender equitable work with men, for example, include:

- Convention on the Elimination of All Forms of Discrimination against Women (CEDAW)
- Millennium Development Goals

Although changing gender roles is very difficult, it is not impossible. It is understandable that there might be resistance from some group of men when talking about gender reform. In societies where gender segregation is strong, it is hard for men to recognise alternatives or to understand women’s experiences (Connell, 2005). Therefore, education and information are important tools to promote equal opportunities for both men and women. Men and women must engage in conversation in order to build mutual understanding between each other. Chowdhury and Patnaik (2010) also address the significance of men’s empowerment to achieve gender equality. In their study of gender equality in India, they propose that it is impossible to improve gender equality without consent, mindset, and involvement of male population of the society.

Sometimes, men’s experiences are overlooked when stressing women’s disadvantaged experience. This view influences in policy-making that sometimes women’s need is over-prioritised, therefore men’s need is subverted (Fulu, 2007). Chowdhury and Patnaik (2010) found that the failure of some women’s welfare policies in India is
partly caused by lack of direct involvement and positive attitude of males, and too much emphasis on females. With quota and reservation system, women receive better opportunity in employment, when men lack of the same kind of opportunity. Men will be more willing to work and engage in activities with women if they are given the same opportunity. Gender equality is about inclusiveness; both men and women deserve equal treatment and dignity. Women’s empowerment is crucial as many women are in underprivileged positions yet too much focus on women might lead to excluding men from the process of gender equality and cause conflict between genders.

1.2. The Link between Gender, the Environment and Energy Technologies

Due to different needs and role of men and women, gender analysis is important to help us understand the differential impacts of environment and energy policies towards both genders. Gender analysis is “a tool to diagnose the differences between women and men regarding their specific activities, conditions, needs, access to and control over resources, and access to development benefits and decision-making. It studies the linkages of these and other factors in the larger social, economic, political and environmental context (ILO, 2000).” Gender analysis also helps us understand different ways which men and women adopt in order to manage natural resources and handle problems that might ensue. Women are often left out of professional training in environmental management, land-use planning, agriculture, forestry, marine sciences, environmental laws, and so on. In spite of women’s involvement in natural resources and the environment, they still lack decision-making power which is crucial for them to ameliorate their livelihood. Pre-conditions of women’s illiteracy and gender stereotypes cause rejection towards women in participating in development programmes (Agarwal, 2002). In reality, women prove to be effective and capable in managing and dealing with environmental issues and natural resources management. At times, they take leading role in development, for example, the Chipko movement in India, in which female villagers stepped up to protect environmental livelihood of their village.

Climate change also brings about many environmental problems and even intensifies natural disasters. Asia and the Pacific is a region which is prone to natural calamities such as floods, droughts, typhoons, cyclones, tsunamis and the like. Women are more likely to be victims of climate change and natural disasters. In the 1991 tsunami in Bangladesh, 90% of those killed were women and women made up 70% of the victims in 2004 Asian tsunami (Rooke, 2009). With disadvantages in economic resources and political rights, it is harder for female victims to recover from the aftermath of disasters. In countries where women’s mobility is restricted by cultural norms, it is difficult for women to find work outside areas which are affected by disasters, while men have more opportunity and ability to move out from disaster-prone areas. Furthermore, women and men have different concerns when dealing with disasters; for example, women are more concerned with domestic responsibility while men are more concerned with income and transportation (Ikeda, 2009). Given these data, it is therefore crucial to note that gender analysis has to be considered when we talk about climate change and its consequences because women and men are affected by climate change differently.

In terms of energy technologies, the rural population in developing countries still experience inadequate distribution of modern energy sources such as electricity.
People in rural areas continue to rely on traditional fuel such as solid biofuel, namely dried leaves, wood, animal dung, agricultural residues, and so on. Women are closely involved in energy use in the household primarily because they use biofuel in cooking. Without proper ventilation systems or improved cooking stoves in the kitchen, many women in rural areas are disproportionately exposed to smoke and particles. In other words, they are more exposed to indoor air pollution. Indoor air pollution is considered one of the major health risks by World Health Organization (WHO). Rehfuess (2006) suggests that in 2002, 1.5 million people die from indoor air pollution, the so-called ‘kitchen killer’. In that year, this ‘kitchen killer’ caused 483,000 deaths in South-East Asia and 466,000 deaths in China.

In addition, the reliance on traditional biofuel forces rural women to fetch fuel from outside which requires hard labour and sometimes causes physical injuries to women. As we can see, energy poverty leads to serious problems and there must be improvement in energy technologies. Modern energy sources such as electricity can improve life conditions of women and girls. It can reduce women’s household burden and increase their economic production; for instance, through the use of water pumps, electric milling machine and electric cooking stove, etc. The case of women in Chitral province in Pakistan showed that electrification can help increase women’s economic freedom. It is reported that, as a result of electrification in the province, women can work at night so the production of ‘shu’ (traditional woolen fabric) increased and women earned more income (ENERGIA, 2006). Electrification can reduce indoor air pollution as well as increase level of education of girls. This is because they have access to electric lighting, which helps them study after dark if they are kept too long to do so by day.

Whereas women bear the negative effects of their domestic role, namely indoor air pollution, this report will also illustrate men’s experience regarding their gender roles. Men participate in energy industry, such as coal mining industry, more than women because of assumption of male characteristics as physically strong, decisive and risk-taking. Moreover, women labour is perceived as requiring higher cost because of maternity leave provisions (Yao, 2006). In China, coal mining industry killed thousands of its workers each year. Miners, most of whom are male, suffer from health problem such as lung disease and are affected by serious accidents in this dangerous occupation.

In addressing gender issues in terms of environment and energy technologies, gender-disaggregated data are needed. Unfortunately, there is still lack of gender-disaggregated data in general which is crucial for gender analysis. The existing gender inequality must be more deeply investigated because women and men still have unequal opportunities and rights. They also are exposed to specific vulnerabilities when it comes to environmental and energy problems. Gender analysis and gender-disaggregated data will lead to more effective gender-specific policy and practice in environment and energy issues. Environmental and energy problems are not gender-neutral. There are gender disparities that contribute to different degrees of vulnerability between men and women; and most of the time, women are found in more vulnerable positions when facing these issues.
2. Gender and the Environment

2.1. Gender and Our Relations to the Environment

Energy production and use often results in adverse impacts on the environment. These impacts take the form of climate change, forest and land degradation, and air, water and soil pollution. The severity of such impacts is determined by the manner in which energy is produced and used by the population, legal structures concerning energy, as well as cost mechanisms (Vera and Abdalla, 2005).

Studies on gender analysis often indicate that women and men hold distinct correlations with resources of the natural environment due to their different duties and needs. Gender norms that differentiate between male and female spheres of work denote that men and women embrace different practices when dealing with the environment (Lallement, 2008). Few women are trained as professional environmental managers with decision-making power, such as land-use planners, agriculturalists, foresters, marine scientists and environmental lawyers, and they are often underrepresented in policy-making that affects environmental quality. However, on a local village level, where decentralised action on environmental issues is most beneficial, women have demonstrated an ability to effectively influence sustainable consumption decisions. It is not surprising for women to take on leadership roles in environmental management, such as leading in promoting environmental ethics or reducing the use of natural resources through grass-roots campaigns. In particular regions, women constitute the more stable members of their communities as opposed to men, because men regularly leave their villages in pursuit for work in distant locations, whereas women often remain in their villages, thus taking on the responsibility of conserving the environment and ensuring sustainable distribution of resources within the community.³

Contaminated water and soil, deforestation, and construction of dams equate to additional challenges that women have to overcome in their daily tasks of gathering food, water and energy fuels for their families. In order to acquire a better understanding of gender relationships and the environment, it is necessary to properly analyse patterns of use, knowledge and skills involved in the use of natural resources by men and women.

2.2 Traditional Knowledge

For generations women have been responsible for producing, gathering and preparing food, collecting water and fuel resources. Consequently, they bear traditional knowledge about the environment, as to where these resources can be found, and what to do when resource levels are inadequate. For this reason, women are more familiar with ecological processes such as plant maturation, fruition or reproduction. Women have also been recognised as the primary victims of environmental degradation due to their close associations with the environment. Indigenous women, whose livelihood and daily subsistence depends directly on sustainable ecosystems, have played a significant role in preserving their cultural heritage by passing down traditional knowledge and managing local resources in a sustainable manner. They have been

recognised as “the custodians of biodiversity for many of the world’s ecosystems and practitioners of medicine, pharmacology, botany, nutrition and keepers of agricultural technology that sustains poly-cultures critical to maintaining biodiversity” (Kelkar 2009, p.7). However, the traditional positive roles of women including those of indigenous women are in decline (International Indigenous Women’s Forum Declaration, 2005).

An example depicting the importance of women’s traditional knowledge can be found on the Kumaon hills of the Himalayas in North India, where the subsistence of local communities remains dependent on self-sufficient farming and proper management of natural resources, with many of these practices stemming from traditional knowledge of women farmers. Men have knowledge concerning cash crops grown for profit, whereas the traditional knowledge held by women pertains to the core practices of crop production, the breeding and raising of livestock, the growing and tending of forests, and the know-how of sowing seeds of different crops, all of which are essential for the preservation and consumption of resources.

Within subsistence farming systems, women are responsible for the preparation of farm yard manure in which pine needles and oak leaves are mixed with dung and organic refuse. This method assists in waste management, and also releases micronutrients and macronutrients into the soil that is beneficial for plant growth. As to the management of seeds, women use traditional methods to collect, prepare and store them. Seeds are often mixed with cow dung or walnut leaves to keep pests away, and stored in hollowed gourd shells or pinewood boxes. Traditional knowledge of women also includes information on different types of plants, and how plants should be pruned to give maximum productivity.  

2.3 Community Forestry Programmes

The management of natural resources by local communities has, for a long time, been perceived as a common occurrence. An example of local resource management is the operation of community forestry programmes, which is gradually gaining popularity amongst countries in their aim to encourage participative development. A closer observation of the social arrangements that govern resource management reveals the unequal power configuration between men and women that is prevalent within patriarchal structures.

India and Nepal are two countries in South Asia that have demonstrated support for community forestry programmes. Within these countries, community forestry institutions are responsible for managing government-owned forest land that has been conveyed to local communities for governance and protection, whilst dividing between themselves the duties and benefits. In most parts of India, land that satisfy conveyance prerequisites are mostly degraded forests, however in Nepal, land of better quality can also be transferred. By the early 2000s, around 20% of forest land in India, and 10% of forest land in Nepal had been transferred, involving approximately 8 million and 1 million households in India and Nepal respectively.

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http://www.conference.ifas.ufl.edu/ifsa/papers/e/c1.doc
A community forestry institution typically consists of a general body comprising of members from the village, and an executive committee made up of 9 to 15 members. The executive committee has prime decision-making power, and cooperates with members of the general body to ascertain rules for forest management, such as rules for forest use, forest protection (patrol guards), and benefit sharing. Forest protection is often initiated by forest closure, which means restricting entry into the forest, and prohibiting forest use. In certain circumstances, such restrictions permit the extraction of particular resources such as firewood and non-timber products. On the whole, forest closure helps to improve forest canopy and biodiversity (Agarwal, 2001).

Among the people who were involved in restoring the forests were groups of mixed gender and groups of only men or women. Community forestry institutions with a high percentage of women are usually groups that had been motivated by local NGOs or international sponsors, or in rare cases, formed by women themselves particularly because they were concerned about their exclusion from male-dominant groups. These women often form informal protection groups, which differ from formal protection groups in that the former lack proper structure and the authority to enforce rules.

There has been consensus that effective forest management requires effective participation of local villagers. Participation paves the way to empowerment, and ultimately, to equity and sustainability. Nepal acknowledges that a key weakness of its community forestry programmes is the unequal representation prevalent amongst forest users. It was reported that women are often left out of meetings on forestry management because they were not informed about them by men. Even if they do attend the meetings, very few women dare to express their concerns or opinions or assert their influence; it is commonly believed that what is said by women receives little consideration. Many women remain passive participants throughout the sessions. In Nepal, there was a noticeable difference between the all-women groups and the other groups, in that a comparatively larger percentage of the all-women groups received smaller and poorer sections of forest land that were mostly barren whereas other groups, such as the male-dominant groups, received larger and higher quality areas of land and natural forests. In response to this inequity, local forest officials asserted that all-women groups may lack the competency to effectively protect the forest land, and that the women’s abilities needed to undergo initial testing through the distribution of small plots. Male members and forest officials rarely confer with women when establishing forest rules or plans for development. This is despite the assessment conducted by the forestry department showing that a significantly larger percentage of all-women groups achieved improved canopy cover as opposed to other groups. The reality contributes to the notion that the processes of participation is undermined by social norms and standards which often act to disadvantage women.

From a critical perspective, although these forest programmes bring about improvements to the environment, the fact remains that women inevitably face direct hardships associated with forest closures. Initially, women were able to meet energy demands by travelling short distances into nearby forests to gather firewood, but forest closures meant that women faced firewood shortages, and were compelled to expend additional time and energy to travel to other sites situated further away, whilst confronted by hostility expressed by residents from other villages. Women resorted to other energy sources; those who were better off switched to biogas stoves and kerosene, whereas others switched to inferior fuels such as agricultural waste, dung cakes, and small twigs which are less convenient as they require more time to ignite.
Researchers found that a large portion of forests remained subject to closure even though they had been restored. Women continued to report firewood shortages despite the forests having been protected for several years (Agarwal 2001, p. 1628).

Results in Nepal and India demonstrated that a group’s gender composition affects conservation outcomes. With regard to community forestry institutions where executive bodies comprised of a higher number of women, the forests’ condition showed considerable improvement. In Gujarat, India, executive bodies with more than two women were found to rank higher in terms of overall forest condition, as opposed to bodies with less than two or two women. Furthermore, across Nepal and India, a higher percentage of women on the executive body correlated with a lower percentage of degraded forest area.

The participation of women in forest management programmes allows the opportunity for women to bring forward their concerns, and contribute their traditional knowledge on forest species and practices on extraction. Involving women in the executive committee also means that they will have greater motivation to comply with the rules themselves, as “involvement in rule formulation tends to enhance rule compliance”. It also helps disseminate consciousness of the rules and practices among village women who might be excluded from such meetings. This is not to state that all imbalances will be resolved exclusively by the presence of women in decision-making processes. Women will probably continue to bear the burden of firewood shortages, a responsibility attributable to traditional gender division of labour. All the same, participation by women can result in more impartial rules of distribution with regard to costs and benefits. For instance, participation could allow women greater influence in benefit-distribution decisions; it could stimulate the formulation of less restrictive closure rules to permit extraction of resources from restored forests, it could encourage the community forestry institutions to address the challenges associated with fuel shortages by reserving plots for fuelwood plantations, or by using community funds to subsidise alternative energy use. In this way the problem of fuelwood shortages would not be perceived as one belonging to women only, but as a complication involving the whole village (Agarwal 2001, p. 1636).

Furthermore, the presence of women on the executive bodies allows for better forest protection, because village women are more likely to be involved in patrolling if they are on the executive bodies, which is more efficient than having only men patrol. Women in patrols are in better positions to detain female trespassers, whereas men might be hindered by cultural restraints if they were to physically come in contact with female trespassers. Having landless women on the executive board could also prove to be beneficial as they are mostly dependent on the forest, and their ability to relate to other landless female villagers could increase the level of forest protection among landless families, who tend to remain excluded and sometimes opposed to forest closure. Age, which encompasses both a gender and a general aspect, is found to be a relevant factor in forest protection. Community forestry institutions with older women on their executive committees have demonstrated greater improvements to the state of the forest, mainly because older members possess more experience in conservation efforts, as well as exemplify more authority (Agarwal, 2009).

2.4 Land Rights

Women have limited access to land and property as a consequence of traditional
norms and laws. Globally, only around 20% of landowners are women. In Bangladesh, approximately 800,000 out of 28 million women own land (0.02 %). In India, the figure is approximately 13 million out of 120 million (0.1 %); in Nepal, approximately 270,000 out of 3.4 million (0.079 %) and in the Philippines approximately 520,000 out of 5 million (0.104 %). A right to land and property is fundamental for economic security and physical shelter. A woman’s right to land and property, and the extent of such a right, constitutes an influencing factor to her general living conditions. Women’s lack of access to land rights means that they are denied the economic and social sanctuary that accompanies property ownership, and are thus more vulnerable to crisis.

Since women often do not have secure ownership of the land they cultivate, there might be little enticement for them to make decisions that are beneficial for the environment. A lack of legal title to land and property among women also means that they are unable to obtain security for acquiring loans and credit, which might further prevent them from purchasing clean technologies that are less destructive to natural resources. A combination of these factors set into motion a cycle of waning production and increased levels of environmental deterioration.

2.5. Mechanisms for Women’s Rights to Land and Resources

Women’s lack of rights to land and resources constituted a common state of affairs that persisted over many centuries in much of Asia-Pacific. However, over the past few decades, it has become a dilemma in the face of widespread transformation that is occurring within societies. Colonialist administrations introduced the conception of individual legal title to land and property across many communities in Asia. Such an introduction was effective in formalising individual rights to land and property, but it also had the effect of weakening traditional protection mechanisms for women. For instance, in some communities, a person’s access to land was contingent on his or her status within the household rather than upon concrete rights to possession. Even though women had no legal rights to land and property, they were entitled to ‘use rights’ which allowed them access to land and resources. Colonial influences to property rights corroded these traditional mechanisms, ensuing in a situation in which women became more vulnerable (Steinzor, 2003).

Numerous countries in Asia-Pacific have embarked on interventions to improve the situation for women in terms of their rights to property and natural resources. Law and policies providing these rights have become increasingly important in much of today’s world as women become progressively concerned and aware of their exclusion and under-representation in this area (even though insufficient awareness of laws remains a major problem for women in their pursuit of legal remedies). National legal instruments, as well as international instruments such as the International Covenants on Economic, Social and Cultural Rights and on Civil and Political Rights, the Platform of Action agreed to at the 1995 Beijing World Conference on Women, and the Convention on the Elimination of all Forms of Discrimination Against Women have addressed the significance of women’s rights to property and inheritance.

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6 Ibid.
It remains a challenge for rights contained in international agreements to be converted into reality. When a country ratifies an agreement, it is required to take further steps to enact domestic legislation so that such rights can be enforced on a national basis. Developing countries often suffer from substandard mechanisms of enforcement that prevent the realisation of many rights. In addition, the accomplishment of such provisions has been more or less stymied by social, cultural and religious norms that have long historical roots and favour patrilineal inheritance practices in much of the Asia-Pacific region, many of which act to counter the progress of women and position them at a disadvantage as opposed to men. These norms result in women’s lack of control over resources in both rural and urban contexts, which subsequently affects their ability to secure a place to live, to preserve a foundation for survival, and to seize economic opportunities. It also makes women reliant upon male relatives for survival (Steinzor 2003, p.4).

Listed below are several approaches adopted by developing countries in the Asia-Pacific to enforce women’s rights, along with the countries’ traditional customs and social norms that result in gender-differentiated rights.

**Malaysia**

**Approaches Implementing Women’s Rights**

- The National Agriculture Policy (NAP) (1992-2010) aspires to achieve “a market-led, commercialised, efficient competitive and dynamic agricultural sector within the context of sustainable development”. It provides for schemes to increase the level of women’s participation within the fields of agriculture and rural development, for instance, in horticultural projects which involve the handling of vegetables, cut flowers and nursery production.

- The Department of Women Development and the Institute of Public Administration offer gender sensitisation courses for policy makers and community leaders.

- The Department of Agriculture and the Federal Agriculture Marketing Authority assist in the promotion and marketing of products made by rural women.

- The Rural Economy Division of the Ministry of Rural Development provides funding to rural women in their purchase of agricultural machines.

**Encumbrances to Women’s Rights**

- Cultural and religious (Islamic) norms deter the participation of women in decision-making bodies. Often, women have limited discretion in the handling and management of resources.

- Women organisations usually operate on a village level, and are less likely to be represented in formal or nation decision-making processes.

- The lack of legal services amongst rural communities acts as an encumbrance to women seeking justice. Furthermore, religious and statutory legal bodies are comprised of mostly male members, which might give rise to a lack of understanding or compassion towards problems concerning women.

Exception: Matrilineal communities exist in the districts of Kuala Pilah, Rembau, Jelebu and Tampin of Negeri Sembilan. These communities abide by the customary
law of Adat Pepatih, which postulates that ancestral property and land can only be inherited by female members of tribes.

Nepal

Approaches

- The Lands Act 2021 was ratified in 1964 to allow equitable distribution of agricultural land. An amendment was made to this Act in 1997, thereafter stipulating that women of 35 years of age and above were able to inherit tenancy rights similar to men.

- Article 20 (4) of the Interim Constitution of 2007 provides for sons and daughters to have equal rights to ancestral property, whereas Article 35 (13-16) states that Nepal shall accelerate rural development by creating special conditions based on positive discrimination for minorities, and disadvantaged groups including women.

- The Women Farmers Development Division (WFDD) of the Ministry of Agriculture and Cooperatives cultivates the advancement of female farmers. It acts to promote gender mainstreaming in agriculture, development of agricultural entrepreneurship for women, and dissemination of gender disaggregated data on women and agriculture, as well as provide training courses for female farmers.

Encumbrances

- Religious beliefs (Hindu) stress on family property being inherited by males within the ancestral line. This has resulted in most titles to land belonging to males although the land belongs to the family as a whole. In most communities, property is usually passed from father to son although Article 20(4) (mentioned above) prescribes otherwise.

- Discriminatory clauses concerning inheritance and property remain contained within Nepal’s Country Code. For instance, provisions require that women attain consent from their father or sons before they dispose of more than half of family land, and that married women are not to be regarded as co-heirs in the succession line.

- The female literacy rate is half that of male literacy rate (UNESCO, 2006). The high rates of female illiteracy impedes women’s access to information concerning their rights.

Viet Nam

Approaches

- Article 33 of Viet Nam’s Civil Code 1995 recognises the rights of women to property ownership, and Article 5 indicates that women shall have full inheritance rights. (In reality, a majority of agricultural land use certificates are issued to men as head of households, whereas 10 to 12% of the certificates are issued to women due to their roles as head of households).\(^7\)

- The Department of Land Office prescribes practices to ensure that rights to the use of land are without discrimination in relation to the sex of the land-users.

\(^7\) Statistics for 2002.
- The Gender Strategy in Agriculture and Rural Development aims to enhance rural women’s access to resources such as land, credit, water resources, infrastructure and public service; and to incorporate gender sensitive objectives into agricultural development policies and programmes.

Encumbrances

- Traditional values are patriarchal in nature (influenced by Confucian values), with men being head of households and the main decision-makers as to resources.

- A wife has limited rights to joint property, and many divorced women do not own land for cultivation as they do not inherit land from their parents or from their husband’s family. This is despite Articles 24 and 25 of Decree 70/2001/ND-CP providing that land-use rights be divided upon divorce.

- The lack of enforcement of gender equity provisions contained in 2003 Land Law has made it challenging for women to gain access to land. Officials at local levels are often influenced by traditional customs that favour men when they administer the law.

- Women have inadequate knowledge about their rights to land and resources, in particular women from ethnic minorities. Their participation in meetings concerning land allocation is rare.8

- Exceptions: Matrilineal communities can be found in some regions, for example, the Gia Rai ethnic group in Gia Lai Province whereby daughters instead of sons inherit from their parents.

2.6. Women’s Empowerment

Women’s positions can be improved by encouraging greater self-reliance through the adoption of skills, increased income and increased decision-making power, thus facilitating the control over their lives. An example of an organisation that promotes the empowering of women is the Green Belt Movement based in Kenya, which constitutes one of the world’s most eminent women’s civil society organisations. The Green Belt Movement started in 1977 as a grassroots tree planting programme for women, instigated in order to counter problems associated with deforestation, soil erosion and water scarcity. Started by Professor Wangari Maathai and the National Council of Women of Kenya (NCWK), the Movement mobilised women to plant trees. It has been successful in reducing the negative impacts of deforestation and also allows women to adopt leadership and decision-making roles. Since 1977, more than 45 million trees have been planted across Africa as a result of the Movement’s efforts to advocate human rights and democratic change through environmental protection.9

Another example is the Chipko movement (tree-hugging movement) that originated in India in 1973, and disseminated to other parts of India in later years. The term ‘Chipko’ means to embrace, and the movement consists primarily of female villagers who hug trees to prevent them from being destroyed for commercial harvesting, although men are also involved and several have played important leadership roles.

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Forests constitute a means of subsistence through their provision of food, fuel and fodder and their function in stabilising soil and water resources, and villagers depend on local forests for primary resources. A triumphant movement occurred in the Northern Indian state of Uttar Pradesh in 1980 in which protestors were successful in achieving a 15 year ban on tree felling in the state’s forests, by instruction of India’s former Prime Minister, Indira Gandhi. Subsequent movements have paved the way for environmental policies that are more receptive to ecological needs; some of these movements also have challenged government policies and traditional perceptions of gender roles.

A project that ideally demonstrates the inclusion of gender mainstreaming in its planning is the Development of Sustainable Agriculture in the Pacific (DSAP) programme, which has been implemented across 17 countries in the Pacific. Established since 2003, the DSAP programme concentrated on working with farmers to improve their agricultural devices, in turn benefiting both male and female farmers as well as local communities. The programme’s emphasis on better management of the environment and natural resources further led to mitigation practices concerning climate change. Its adoption of a ‘participatory needs assessment approach’ to encourage sustainable agricultural production and its incorporation of a gender perspective has been successful in identifying the different needs of men and women.

A consultative process was put in place to listen to local opinions and concerns in order to introduce suitable technologies. The DSAP programme received the Secretariat of the Pacific Community’s Gender Award in 2007 for its gender-inclusive efforts that were influential in incorporating women into capacity-building activities such as technological training. The programme also has set up an advisory board on gender-inclusion, and has trained its staff on the issue of gender sensitivity.

Some development projects have reaped unsuccessful results due to failure by project managers to acknowledge that men and women have different needs and different levels of access to resources. An appropriate gender analysis must occur at the consultation stage so that gender sensitivities of a particular village can be noted. Consultation may be perceived as the initial phase of participatory planning. An efficient approach would be to arrange “genderised” consultation by holding separate meetings with men and women. This permits data collection on both genders and sheds light on differences and similarities in men’s and women’s needs, main concerns, and restrictions, and to ensure that women’s perceptions on the issue are included. These types of information can then be used to inform project-planners as to the most productive strategy to employ. A lesson can be derived from the case of an FAO fuelwood tree-planting project in Thailand, in which male villagers demonstrated support for a FAO tree-planting proposal to benefit women within the village. Seedlings were delivered to the village, but planting did not occur. It became apparent that planting was categorised as a female duty in that particular village, and the seedlings were delivered during a period when women were extremely occupied with rice-planting. An omission like this could have been prevented if project managers had consulted with the women (Skutsch, 2005).

Holding consultation with women and men as distinct groups would also overcome certain customary taboos where only senior figures consisting of mostly men are

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10 DSAP has been implemented in Fiji, Cook Islands, Federated States of Micronesia, French Polynesia, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, and Wallis and Futuna.
allowed to voice their opinions, and raises opportunities for women to put forward contentious matters. For example, these consultations might determine the preferences of women, their prospects for the future, and whether men are supportive or in disagreement with such transformations. It also will be possible to avoid past oversights by noting specific preferences of women who are primarily cooks in the family; for instance, realising the disadvantages of solar cookers as it can only function outdoors under the sun. In Madagascar, there are cases where women cannot use solar cookers to prepare breakfast or dinner because there is no sun. In addition, in the box type solar cooker the cooking time takes about 50-100% longer than on the open fire since it is low temperature cooking (Vetter, 2006). Moreover, bearing in mind the importance of consultation, it is usually beneficial to employ female staff who can better interact with women respondents, and to overcome certain cultural restrictions that affect female mobility.

2.6.1 Rice intensification and Women’s Empowerment

Rice and traditions

The system of rice intensification (SRI) – discussed below with regard to recent practices in India and Cambodia – provides an answer to the plight of society's 'shunned' or 'handicapped by age' members. Women fall under the afore-mentioned categories as well, where they may participate in maximizing gains from the system of rice intensification and formulate strategies to install permanently such systems in the codes of (rice) farming, in their respective communities.

India, as a rapidly-expanding economy holds promise of upgrading agricultural practices that not only nurture the produce/yield, but also provide livelihood to females across generations. Cambodia also stands as a relevant example where successful implementation of SRI is seen in some areas. The extent to which women may participate in such practices was in earlier stances, frequently determined by their male counterparts. A positive shift toward economic independence, preserving individuality and self respect, and the pride of earning through one's own efforts and will; all complement the benefits of the system of rice intensification.

2.6.2. System of Rice Intensification in Cambodia

Examining the adoption of the System of Rice Intensification (SRI), Resurreccion et al. (2008), conducted in-depth study and analysis into “Livelihoods Diversification and Gender in Changing Cambodia” (Resurreccion et al., 2008). Equitable access to assets and opportunities are a rarity in rural households, and farmers rely upon traditional means of livelihoods. As Scott (1988) pointed out, gender stands out as a primary way of signifying relationships of power (Scott, 1988 cited in Resurreccion et al., 2008). Gender differences exist, as men develop strategies for production of cash crops, and women, production of food crops for household consumption. Gender affects issues of farm activity and labour, access to and control of land; and divisions may include those based upon work, responsibility, knowledge, and rights to use and decide the use of resources and farm products (Resurreccion et al. 2008, p.15).

A mixed-methods approach was employed in the research, analysing the impact of SRI agriculture on gender relations, and secondly, the process of programme implementation. Moving from conventional rice farming to SRI adoption, respondents
were asked whether the 12 SRI steps required less, the same or more labour contributions compared with their conventional rice agriculture. It was found that most of the group and individual interviews with women farmers agreed that they used less time in agriculture. Consequently, they have more time for reproductive tasks. A general atmosphere of satisfaction persisted, and farm women also appreciated the time available to them for village meetings. The study also cited that through 2006 – 2010, The Cambodian Center for Study and Development in Agriculture (CEDAC) aimed to “strengthen the capacity of 100,000 women in farm-household management and enable them to participate in local development through group training and an exchange programme”.11

It was also seen that there was little efforts directed towards raising awareness on gender issues; and older farm women were enjoined to realize the goals laid by CEDAC. The older women were increasingly confined to obligations of farming, and food provision, and food security goals were being met to an extent at the expense of greater gender equality for older women. Regarding adoption of SRI in female-headed households, it was seen that of the 2.5 million households in Cambodia, 29% were headed by women, and was slightly higher in rural (29%) than urban (28%) areas (Resurreccion et al., 2008). A focus group discussion in the village of Orung, Kampong Chhnang Province, with mixed farm women and men showed that 11 female-headed households had adopted SRI farming methods, from the 26 that were female-headed, out of a total 116 households.

Keeping in view the gaps in research, and lack of government support to agriculture and emergence of other cash-generating non-farm livelihoods, farming has become a residual livelihood (Resurreccion et al. 2008, p.64). Rural villagers facing rising food and rice prices may as well retreat to farming, when non-farm livelihoods contract. Farming yet remains a support in troubled times, and is seen to be adopted by rising number of females. Therefore, it is not surprising that farming is often left in the dutiful care of mothers and older women, a process akin to ‘housewifization,’ or that is often referred to as the ‘feminization of agriculture’ (Resurreccion et al. 2008, p.82). Further studies must be undertaken, and government efforts paced to facilitate rural and urban farmers, especially at times where price hikes and inflation threaten livelihoods to their citizens.

2.6.3. System of Rice Intensification in India

In 2006, a study was conducted by Dr. C. Shambu Prasad, into the ‘System of Rice Intensification in India, Innovation History and Institutional Challenges’ (Prasad, 2006). Although innovation in the agricultural sector may be the outcome of any of a multitude of sources, yet it is widely known that most significant improvements through the late 20th century have come through conversion of the results of scientific research, into technological applications. Theories may be revised or abandoned when they are tested under real circumstances. The ‘innovation’ process proceeds likewise. Furthermore, innovations prove vital to society’s evolution, and favourable to “relatively more advantaged and well-placed compared to those who were less well-endowed and more marginally located” (Prasad 2006, p.7) From a historical perspective on technological innovation, in the case study by Dr. Shambu Prasad, on

System of Rice Intensification (SRI), is instructive, a reason being its deviation from the usual way prior issues were examined, and debates formulated.

Traditions hold great reverence for Asian communities, and their adherents would likely hold such traditions much closer than they would, their own lives. It is within the same ideological framework, that researchers, policy makers, and community workers who try to bring innovation, face difficulties. The resistance may be in the form of resistance to the ‘new’ themes and mores. SRI has also challenged conventional ways of farming, and in such, faces resistance. The greater merit of the farmer, and his ability to judge best has been laid a founding notion, in such societies; and it is possible to utilize it, to capacitate an increasing number of societies towards further agricultural advances. Fr. Henri de Laulanié, the originator of SRI, found and demonstrated that the practices of (by now) billions of rice-growing farmers have been mistaken and counterproductive (Prasad 2006, p.8).

However, the adaptability of the SRI extends beyond such allegations. Its emergence speaks itself of originality and demands a level of attention. As SRI is relatively a new concept, the implications of this innovation remain unprecedented, and this factor furthers its importance. It has been seen that SRI methods bring fruitful results simultaneously, in the form of raising productivity of land, labour, as well as reducing amount of water and capital employed in irrigated rice production. These unprecedent results challenge notions of ‘existence of trade-offs’ and ‘free lunches.’ SRI therefore challenges as much to premises of economics as to prior research findings of agronomy (Prasad, 2006).

Although the origin of SRI may be traced to mere attempt of examining the amount of water that may be reserved; this has come to form a comprehensive assessment of SRI through involvement of many stakeholders. The benefits of SRI have begun to provoke acclaim and acceptance, rather than apathy, even from traditional farmers. Farmers of poorer rural areas may also benefit from a lesser economic burden as their yields are not marginalized, when cutting costs of inputs. The project was continued in Kharif, 2006 increasing the magnitude of the study; with civil society organizations collaborating efforts with the available infrastructure at the university.

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12 Coverage so far (at time of publishing of report), numbered 700, i.e., 11 districts, and 6 research stations). For further on Rice Intensification in India, see Prasad, 2006.
3. Gender and Energy Technologies in Asia-Pacific

3.1. Gender Aspects of Energy Poverty

It is difficult to observe the correlation between gender and energy without first discussing the issue of poverty. This is because poverty has direct effects on an individual’s access to energy, in the sense that being poor is linked to having limited access to energy. Thoughts on poverty are now centred on the wants and needs of the poor, rather than previous definitions that focused on the wants and needs of professionals. Poverty is defined by the United Nations as “a denial of choices and opportunities, a violation of human dignity”. It entails a lack of capacity to participate effectively in society, a lack of access to education and medical services, a lack of sufficient food and access to clean water, and a lack to ownership of land and property. To live in poverty is to live in uncertainty, powerlessness and exclusion (Gordon, 2005).

Energy deficiency is identified as a major cause of poverty in developing countries. At the same time, poverty is what prevents people from accessing energy services, thus leading to an incessant cycle that is not easily broken.

“The energy dimension of poverty -energy poverty- may be defined as the absence of sufficient choice in accessing adequate, affordable, reliable, quality, safe and environmentally benign energy services to support economic and human development.” (World Energy Assessment, 2000).

At least 2 billion people around the world lack access to modern forms of energy such as electricity and liquid fuels, which are deemed essential for economic development and poverty alleviation. The kind of energy used in a household has important implications for the health of the members in the household and, often, it is the health of the household’s women and children that are most affected, as described below. It has implications for the environment and, as argued in this monograph, environmental implications also gendered. In the Asia-Pacific, more than 80% of the rural population are dependent on traditional fuel sources such as biomass for cooking and heating, mainly because these fuels are easily available and do not require processing before use. Traditional biomass energy, gathered as a free fuel in the form of wood, leaves, agricultural residue, charcoal and animal waste, has been referred to as the energy source for the poor (Cecelski 2002, p.2).

Energy development has been prescribed as a goal for many countries. It demands sustainability in economic, social and environmental terms, and is believed to be best achieved through energy efficiency and the use of renewable energy.

Indeed, for many years now, protection of the earth has become the ultimate goal of achieving sustainable development, the solution for the future. However, sustainability is at the moment very expensive and is not affordable for all countries and people of the world. As the United Nations Department of Economic and Social Affairs (UN/DESA) (2009) states:

“Despite these rapid advances, renewable energy remains expensive, especially for the two billion people who have no access to modern energy services. Prices are falling, driven by increasing market demand, scale economies, and technological diffusion as well as technology improvement. But prices have not fallen fast enough to make such technologies affordable at large scale in developing and emerging industrial economies. They have not fallen fast enough to outcompete coal, oil, and
natural gas as the default choices for energy. They have not fallen fast enough to offer a realistic alternative to millions of women huddled over wood fires, or to others who continue to suffer from the health and planet damaging soot of burning biomass.”

Even though energy technologies nowadays give us various choices of renewable and eco-friendly energy, most remain too expensive for the poor in developing countries. Renewable and clean energy such as solar and wind energy emit less pollution and greenhouse gases than fossil-fuel and coal sources. The United Nations Department of Economic and Social Affairs (UN/DESA, 2009) published a strategy paper, calling for a ‘big push’ in both public and private investment to scale up renewable energy which will rapidly reduce cost, enhance technology improvement and learning. This ‘big push’ cannot be implemented by any country alone. UN/DESA suggests further that in the first decade-and-a-half, it will require globally funded guarantees, or price supports (e.g., through a global "feed-in tariffs" program), to subsidise investment. This strategy is called ‘The Global Green New Deal’ (GGND). The objective of GGND is to make renewable energy affordable and make renewable energy the default for the whole world. Moreover, GGND could be an engine of true ‘green growth,’ improving per-capita incomes and employment in countries around the world. GGND advocates argue that the greater levels of job generation, energy reliability, technology advance, and economic stability, together with reduced vulnerability to fossil-fuel price fluctuations, can help support the world's long-term recovery from the ongoing financial crisis. This strategy also includes the need for mechanisms to satisfy energy needs in off-grid communities (for example, local grids in the communities) in which large-scale solar energy cells or wind turbines cannot reach (UN/DESA, 2009).

However, while many developed countries have been considering eco-friendly development for some decades, many developing countries are in phases of rapid economic development and in growing need for energy. A number of developing countries claim that protection of the environment is not their first priority as they attempt to raise the economic conditions of the country. For example, China still plans on using coal as their main energy source (Bosworth et al., 2012).

Whenever a particular technology is applied in a community, there will be gains and losses for different groups of people. In this report we will examine the gains and losses for different groups with a gender lens.

Where energy use is limited solely to renewable sources, additional encumbrances may be placed upon people living in poverty mainly because they are deprived of chances for some types of productivity growth that fossil fuel technologies make possible. As such, it is important to ensure that there is a balance between access to renewable energy sources and fossil fuel technologies.

Energy is used for household needs for cooking, lighting, and heating purposes. On a professional level, the energy sector consisting of technical skills such as electrical installation and construction of energy-related devices are mainly male-dominated. However, the gender aspect of energy poverty lies in the fact that women constitute the main suppliers and managers of energy in rural regions of developing countries, a role that has been acknowledged since the 1970s, when awareness was developed about the customary roles of women in traditional fuel collection and preparation (Office of the Special Advisor on Gender Issues and Advancement of Women, 2009).

The World Summit for Social Development held in Copenhagen in 1995 brought to
global attention that the majority of poor people consist of women (Rai et al., 2010). A gender analysis of energy poverty involves the study of the ways in which gender distinguishes the societal practices resulting in energy poverty, and the relevant escape paths out of impoverishment. Over the last three decades, issues surrounding gender, energy and the environment have received increased importance in debates on sustainable energy development. Existing strategies on issues of gender, energy and poverty include:

- Collecting evidence and experience which connect gender issues in energy policies to sustainable energy and development;
- Raising national and international awareness of the importance of integrating a gender standpoint to energy and development policies;
- Providing advice and assistance to energy programmes and projects as to means of incorporating gender aspects; and
- Forming network systems at national and international stages to accomplish these strategies (ENERGIA, 2008)\textsuperscript{13}.

3.2. Reliance on Traditional Fuel Sources and Exposure to Gender-related Risks

\textit{Time}

In the absence of access to clean and efficient technologies, rural women spend substantial time gathering wood fuels for household use, sometimes across long distances due to scarcity of resources. In Nepal, some women walk over 20 kilometres per journey to collect fuel wood instead of being involved in income-earning activities. The gathering of fuels is labour-intensive, and has been linked to the suffering of back and spinal disorders, frequent falls and bone fracture as well as miscarriages during pregnancy. Furthermore, girls frequently miss school to help with gathering fuels, contributing to low female literacy rates in many rural regions. The increasing scarcity of wood fuels due to deforestation has resulted in additional time and energy being spent on fuel gathering activities, as women are compelled to travel further to obtain these resources (Denton, 2002).

On a commercial front, women are also considerably involved in the production, transport sale of wood fuels to many cities of developing countries. They are usually engaged in informal sector enterprises, which require the undertaking of arduous tasks for low wages, such as the lifting of heavy containers of hot liquid in palm oil production or being exposed to harmful emissions in biomass-using industries.

\textsuperscript{13} However, critics of such strategies have expressed that current efforts are inadequate. Challenges identified by these critics include:
- Insufficient funds for energy access programmes, and limited financing sources;
- Methods of administering energy price subsidies to the poor are inefficient, often resulting in subsidies being directed to the non-poor;
- Limited institutional competence to provide for large rural populations that reside in remote areas;
- Lack of monetary incentives for businesses dealing with energy development for the poor; and
- Limited co-operation and poor exchange of knowledge across regions.

It is important that these challenges be addressed by policy developments.
Figures do vary, but it has been estimated that women of developing countries spend around 2-9 hours per day gathering fuel and fodder, as well as cooking (World Bank, 2001).

**Indoor Air Pollution**

Traditional fuels and technology result in very poor energy conversion efficiency. For instance, in the case of India, the efficiency of traditional cook-stoves using fuel wood is equivalent to an average of approximately 15%, whereas the efficiency of electricity used in cooking is 75% (UNDP and ESMAP, 2004a). The combustion of biomass, often by inefficient traditional devices such as unvented bio-fuel cooking stoves, has resulted in household members being exposed to indoor air pollution. Since women undertake the traditional duty of cooking, they are most susceptible to the negative effects of indoor air pollution.

The World Bank conducted a study in Andhra Pradesh, India, regarding indoor pollution levels for 420 rural households, monitored over a period of 24 hours. Results demonstrated that households that used inferior biomass fuels such as straw received the greatest exposure to particulates, followed by households that used wood as the main fuel. According to the Environmental Protection Agency of the United States, exposure levels to pollutants should not exceed 50 micrograms per cubic meter of air, however, households in Andhra Pradesh were exposed to 400 to 700 micrograms per cubic meter of air (UNDP and ESMAP, 2004a).

Indoor air pollution is considered a major health risk by the World Health Organisation (WHO) and by several governments. The constituents of indoor air pollution typically consists of respirable particulates, carbon monoxide, benzene and formaldehyde, which cause acute respiratory infections, chronic obstructive lung diseases, low birth weights, lung cancer and eye problems (WHO, 2010). WHO (2006) suggests that in 2002, 1.5 million people die from indoor air pollution, or so-called ‘kitchen killer’. In that year the kitchen killer caused 483,000 deaths in South-East Asia and 466,000 deaths in China. The number of deaths associated with indoor air pollution is more than deaths associated with malaria (WHO (2007) shows that, in 2002, 1.24 million people from low-income countries died because of malaria) and yet only a modest amount of public funds are spent on addressing the problems of indoor air pollution whereas substantial funding is available for malaria (Lallement, 2008).

Health problems associated with indoor air pollution can be countered with three main solutions:

- Encourage a switch to kerosene and liquid propane gas (LPG)
- Make improvements to traditional woodstoves (this also provides an environmental benefit as greenhouse gas emissions would be reduced)
- Introduce the use of solar cookers or ovens, biogas or electricity for cooking (Cecelski, 2002).

The disproportionate health impacts on women and girls due to traditional energy use are a result of the traditional division of labour (Karakezi et al., 2004).
Physical Injuries

Besides from indoor air pollution, women have to face physical injuries due to the gathering as well as the use of biofuels. According to Wickramasinghe’s (2001) study, in Sri Lanka, biofuels account for 66% of all energy consumed in the country and nearly 81% of Sri Lankan household use biofuels as the source of energy. Additionally, due to the increased population and decline in energy sources, the demand for animal dung, soft wood, small twigs and trimmings for lighting fire is rising. In Sri Lanka, the task of gathering biofuels is still the women’s responsibility, as well as is making use of biofuels for their household. When women go out from their house to gather woods and other kinds of fuel, they tend to be exposed to injuries such as cuts, bruises, sprains, and bone fractures in case that they pull or climb trees. Wickramasinghe reported health problems due to biofuel procuring, carrying and combustion in Sri Lanka, through a survey of 720 households. Table 1 shows the health problems categorised by activities related to biofuels.

Table 1: Health problems reported by at least 60% of households related to solid biofuel use in Sri Lanka (Wickramasinghe, 2001)

<table>
<thead>
<tr>
<th>Sphere</th>
<th>Respondents</th>
<th>Self-Reported Morbidity</th>
</tr>
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<tbody>
<tr>
<td>Procuring</td>
<td>92% Women</td>
<td>Injuries, Skin irritation, Allergic reactions, Fatigue, Snake bites, Backache, Trauma, Fungal infections, Pest attacks</td>
</tr>
<tr>
<td></td>
<td>8% Men</td>
<td></td>
</tr>
<tr>
<td>Carrying (Head loading)</td>
<td>92% Women</td>
<td>Repetitive strain injuries, Stiff neck, Fatigue, Headache, Injuries, Chest pains, Trauma</td>
</tr>
<tr>
<td></td>
<td>8% Men</td>
<td></td>
</tr>
<tr>
<td>Combustion</td>
<td>92% Women</td>
<td>Coughing, Bronchitis, Pneumonia, Acute respiratory infections, Conjunctivitis, Upper respiratory irritation/inflammation, Poisoning, Cataracts, Burns, Headache, Sinus, Skin irritation</td>
</tr>
<tr>
<td></td>
<td>8% Men</td>
<td></td>
</tr>
</tbody>
</table>
Wickramasinghe (2001) also suggests that almost 80% of the respondents identified head loading (carrying things on one’s head) as one of the most exhausting tasks. Head loading leads to immediate health problems; such as fatigue, headaches, pains in the joints and chest. Wickramasinghe emphasised that, from her survey, morbidity rates were only high among women while the men that were surveyed reported no complaints other than occasional injuries.

### 3.3. Gender and Rural Energy Development Strategies

In some remote or rural areas, the lack of access to modern fuels, electricity, and water supplies results in women spending a considerable amount of time and labour on fetching water and collecting and transporting energy sources, as well as in agricultural activities. The general deterioration of the environment results in a decline in the productivity of the ecosystem, which leads to a scarcity of primary resources such as food, water and energy. This in turn imposes a greater burden on women’s responsibilities. For instance, their tasks are made more onerous with forests diminishing, as they have to embark on further distances, spending even more time and energy on gathering fuel wood. Improved access to energy and water in developing countries can assist in alleviating women’s workloads, allowing more time for productive activities that generate income, and more time for political participation and leisure (Rai et al., 2010).

The problems of energy poverty have mostly been dealt with by rural development strategies, which basically refer to strategies that bring about a shift from traditional to modern energy systems. Although such improvements to energy systems might improve general livelihood, it is important to acknowledge that the results are largely determined by those who choose what the energy will be used for, and by the methods through which the energy will be obtained (UNICEF, 2008).

With regard to rural energy technology projects where opportunities exist for public participation, the reality remains that women have been for the most part excluded from, and continue to be under-represented in mainstream energy institutions. Women’s economic or political participation are restricted, despite the fact that they are potential contributors to development policies and practices.

Strategies taken to improve energy access by the poor are unlikely to be successful unless they include, among other things, a gender focus. Gender specialists have repetitively asserted that gender differences need to be mainstreamed into energy policy-making. UNESCO defines “mainstreaming” as a process that transfers what can be perceived as secondary into the core business and main decision-making process of an organisation. In this sense, gender mainstreaming constitutes an approach that concentrates on both women’s and men’s needs and experiences in implementation and monitoring of policies and programmes, assures that women and men receive equal opportunities, and that inequalities are not exacerbated. Nevertheless, it follows that information concentrating on women’s energy needs has been given little importance in analyses that are presented to policy-makers, with the exception being information about the linkage between women and fuel wood. Information presented to policy-makers typically merges men’s and women’s energy needs without differentiating between the individual needs of men and women. The lack of differentiation is due to the misguided assumption that energy is ‘gender neutral’, and that making energy accessible to a certain village will benefit everyone.
in that village equally, contrasting with the reality in which the kind and amount of energy available and its costs result in dissimilar effects on men and women. The fact is that men and women use energy differently due to their different household roles. Men and women also have different levels of access to different types of energy, and shortage of a particular form of energy might have different ramifications for the genders. Furthermore, women are amongst the most excluded groups of society, thus restrictions to women’s rights to management and ownership of resources, and constraints to women’s mobility are examples of factors that influence women’s access to energy (Skutsch, 1998).

Revisions of energy policies will lead to different challenges and prospects for men and women. Accordingly, strategies that work to improve the position of men will not necessarily reap similar results for women. As such, it is important that energy policies take into account energy needs on an individual level in order to implement a gender focus. Rural energy development strategies, such as the provision of electrification, need to disaggregate by gender. They need to attend to women’s requirements to save time and labour, as well as to improve health, security and income.

On this note, it is also important to acknowledge that availability of energy does not necessarily indicate access to it, and that satisfying energy demands does not necessarily mean satisfying energy needs. Access to energy is largely determined by income class and gender. For instance, people who lack the financial resources to access energy technologies and services are likely to find that their energy needs will not be satisfactorily met. Thus, commercially available fuels (electricity, LPG, kerosene) may be available in a village, but the poor may lack access to it. Another approach appropriate in this case is the need-based approach, which entails an evaluation of primary needs related to energy, and a subsequent provision of financial assistance by the state or by donors to facilitate poor people in accessing the essential energy services and technologies. Skutsch (2005) asserts that although this approach is less popular nowadays, some governments and NGOs persist in using it. For example, In India, there have been a number of special rural electrification programmes which ensure connections for the poorest neighbourhoods of a village with considerable amount of state’s subsidy. Challenges associated with the need-based approach as cited by critics are that these approaches are frequently enforced in a top-down manner with gender issues seldom being mainstreamed. Needs are evaluated by professionals, and beneficiaries have insufficient influence in decision-making processes (Skutsch, 2005).

Many governments of the world are eager to tackle the issues surrounding gender, energy and the environment. In spite of this, policy-makers often lack knowledge as to how this goal could be suitably accomplished. Their methods are usually positioned within a political framework, with broad objectives contained in energy policy documents, but without comprehensive instructions as to how such objectives are to be realised or calculated. These techniques do not proffer much assistance to energy planners or relevant agencies to carry out gender-disaggregated evaluations of women’s and men’s energy needs.

It has been proven that improved energy services targeted at tasks that belong under the umbrella of ‘women’s responsibility’ have led to beneficial impacts on women’s lives (as in the case of electrification in Chitral province, Pakistan, mentioned below in chapter 3.5.1). However, in some cases, the introduction of improved energy services has led to traditional female duties being taken over by men. For instance, in
Bangladesh, women who worked in rice plantations were responsible for operating traditional paddy huskers until small-scale mechanised milling machine were introduced. The improved energy services resulted in men taking over the jobs in milling, displacing female employment (Baden et al., 1994). In this case, an introduction of technologies actually allowed men to gain more income whilst exclude women from income generation.

One of the concerns underlying the debate over gender and energy is the extent to which class distinctions between women are considered. While standard gender-analytical tools often treat poor rural women as if class distinctions did not exist among them, it is apparent that this is not a preferable approach. In fact, class distinctions do exist, and women of different classes have different access to energy resources as opposed to men and women from the same class. For instance, richer women are less likely to collect fuel, and if they do, they usually spend less time collecting fuel as tasks can be delegated to servants. Richer women may use gas for cooking whereas poorer women residing in the same village may use waste-wood. Thus, with relation to energy planning and development, it is not adequate to consider gender, but also, class distinctions within the realm of gender (Skutsch, 2005).

3.4. Women’s Participation in Rural Energy Development

3.4.1. Char Montaz Project

An interesting case is the ‘Char Montaz project’ on a south coastal island in Bangladesh, which involved rural women being the main providers of energy service to the local community. Bangladesh’s national electricity grid is not expected to extend to Char Montaz for at least another decade. The project was entitled “Opportunity for Women in Renewable Energy Technology (RET) Utilisation in Bangladesh”, and was funded by Energy Sector Management Assistance Program (ESMAP) since 1999. The programme’s objective was to alleviate poverty through empowerment and income generation of women within the energy sector, and to ensure that households in remote regions could have access to modern lighting at affordable costs. ESMAP assisted in creating the Coastal Electrification and Women’s

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14 By standard gender-analytical tools this report refers to the analytical tools which have their roots in two models. First is the ‘Gender Role Framework’ (or so-called Harvard Analytical Method) which introduced the idea that in planning development projects, the primary variables that need to be disaggregated from a gender perspective are work roles and time inputs on different tasks, divided between productive and so-called reproductive activities (housekeeping and caring tasks which are necessary but which do not directly create wealth). Access and control over resources and benefits are also key variables to be disaggregated by gender.

The second tool is the ‘Development Planning Unit Model’. This model uses these same concepts but introduces also the notion of gender-practical needs (things that women need to improve their daily life) and strategic interests (things they need to change their social position). These two concepts, which were originally set up in a matrix format, form the cornerstone of almost all the gender approaches now in common use, and are so well accepted that their origins are often not acknowledged (See Skutsch 2005, p. 38).

15 ESMAP is a joint programme of the World Bank and the United Nations Development Programme (UNDP).
Development Co-operative (CEWDC), which had 35 female members responsible for manufacturing DC lamps and providing electricity services within off-grid energy systems. The project allowed women to venture into an unfamiliar sector, and worked to elevate their social standing within the village. It allowed women the use of modern technology, and the opportunity to become acquainted with business practices, as well as to expand their decision-making authority within the community. Some female members reported a noticeable shift in traditional gender roles within their households as husbands shared household duties in order for their wives to engage in income-generation (UNDP and ESMAP, 2004b).

### 3.4.2. Barefoot Solar Engineers

Another example in which rural women act as energy operators and providers is the case of ‘the barefoot solar engineers’, consisting mainly of rural women trained as solar engineers. The Barefoot College, based in Rajasthan, India is responsible for training rural villagers to install, repair and maintain solar lighting units for remote villages where electricity is inaccessible. The College is a non-government organisation with the aim of assisting rural communities in becoming sustainable and self-sufficient.16

The Barefoot College sees the training of solar engineers as an income-generating opportunity for the poorer members of communities, and encourages communities to select illiterate or semi-literate middle-aged widows and single mothers as trainees under the six month training programme, since they are more likely to require additional sources of income, and less likely to migrate after training is completed. Barefoot College reported that, since 1989, around 50% of Barefoot Solar Engineer trainees are female17. Costs associated with solar electrification are met every month by households that use the services and benefit from them, and trainees are selected by their villages.

The project has instilled beneficial skills and technical knowledge amongst poorer women, and has also released them from the burden of gathering fuel-wood for energy and reduced the subsequent exposures to pollution from burning fuel-wood. On a village level, it has benefited members of households in the sense that solar lighting is safer and cleaner than kerosene lamps previously used, and villagers are able to pursue income-generating activities after dark.18

Circumstances clearly exist in which the introduction of a new energy technology to members of a community may simply be obstructed by planners’ inattentiveness to basic gender interests within the community. To illustrate this point, the distribution of improved stoves to members of a community is often a very slow process, even though the payback period for fuel saved is frequently very short. This is an occurrence that might be ascribed to gender roles. Both women and men often have their own sources of income, with dissimilar expectations as to how and on what the

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16 The Barefoot Solar Engineering programme is supported by India’s Ministry of Non-Conventional Energy Sources, the European Commission and the United Nations Development Programme (UNDP). The Barefoot College also trains villagers to become teachers, doctors, midwives, dentists, water drillers, architects, computer programmers, accountants, etc. For more information go to http://www.barefootcollege.org/


18 See Barefoot College. http://www.barefootcollege.org/
money should be spent. Women are usually responsible for gathering wood or charcoal as fuel, whereas men are usually in charge of purchasing large household items, such as stoves. If both genders conceived of the household as an economic unit, then an investment in an improved stove would be regarded as an advantage. However, if the household does not see itself as an economic unit, but rather as separate sectors that may even contend against each other, the capital required for the improved stove may prove hard to be made available if the woman has no sources of income under her control.

In other cases, the interests of both genders may coincide, which often ensues in rewarding situations for both parties concerning the adoption of energy technologies. An example is the case in Nepal, in which the success of biogas programmes can be attributed to an act of consistent interests. The use of biogas plants benefitted the women, even though the men, who were heads of households, bore the financial costs. It was realised that the incentive behind the men’s actions in purchasing biogas plants was not due to empathy for the women’s burden, but laid in the fact that possessing a biogas plant improved men’s status considerably (Skutsch 2005, p.9).

3.5. The Need for Improved Energy Technologies

The use of traditional biomass energy is prevalent in many developing countries of Asia-Pacific, and is due to increase in the future with population growth, hence potentially resulting in higher levels of undesirable effects on human health. However, prospects exist for disseminating improved biomass energy technologies, and a number of programmes aimed at improving women’s energy use have been instigated by NGOs and governmental agencies. They introduce the use of enhanced wood and charcoal stoves, biogas and solar cookers, which not only allow for more efficient energy conservation, but also reduces levels of indoor air pollution. Such improvements diminish the responsibility placed upon women and girls to gather fuel and give them more time to take on other activities, in particular income-generating activities, and also increases time for education for girls. In Nepal, improved biomass energy technology is existent in the form of biomass stoves that have been developed to burn biomass more efficiently (up to three times that of traditional cook stoves). The fuel used for biomass stoves is in the form of wood pellets which burn more efficiently, and combustion gas is released outdoor. The biomass stoves have more efficient thermal efficiency than traditional kitchen ranges and do not pollute the air indoors.¹⁹

3.5.1. Electrification

Although some energy programmes do confer some benefits on women, albeit in the household context, the fact remains that transformation from the use of traditional technologies to improved or modern technologies has yet to occur on any sufficient level in many developing countries of Asia and the Pacific (see Table 2 and 3). This is due to several reasons; that many of these countries lack a single agency exclusively responsible for modern technologies in rural regions, or that budgetary allowance for

modern energy exists, or that data on such forms of energy use are often unreliable which makes it challenging to formulate apposite policy interventions.

Women’s responsibilities are not limited to cooking alone, thus the implementation of programmes concerning household cooking energy does not signify that other issues surrounding women’s energy needs have been satisfactorily addressed. Rural women are increasingly accepting economic responsibilities apart from domestic ones, by working outside the home or by establishing small businesses. Their economic activities and autonomy imply increasing need for the access to appropriate energy, such as electricity (Skutsch, 2005).

Table 2: Electricity access in 2009 – Developing Asia

<table>
<thead>
<tr>
<th>Region</th>
<th>Population without electricity (million)</th>
<th>Electrification rate (%)</th>
<th>Urban electrification rate (%)</th>
<th>Rural electrification rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing Asia</td>
<td>799</td>
<td>78.1</td>
<td>93.9</td>
<td>68.8</td>
</tr>
<tr>
<td>China &amp; East Asia</td>
<td>186</td>
<td>90.8</td>
<td>96.4</td>
<td>86.5</td>
</tr>
<tr>
<td>South Asia</td>
<td>612</td>
<td>62.2</td>
<td>89.1</td>
<td>51.2</td>
</tr>
</tbody>
</table>

Table 3: Electricity access in 2009 - Developing Asia

<table>
<thead>
<tr>
<th>Country</th>
<th>Electrification rate (%)</th>
<th>Population without electricity (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>99.4</td>
<td>8.1</td>
</tr>
<tr>
<td>Brunei</td>
<td>99.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Cambodia</td>
<td>24.0</td>
<td>11.3</td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>99.0</td>
<td>0.2</td>
</tr>
<tr>
<td>DPR Korea</td>
<td>26.0</td>
<td>17.0</td>
</tr>
<tr>
<td>East Timor</td>
<td>22.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Indonesia</td>
<td>64.5</td>
<td>81.6</td>
</tr>
<tr>
<td>Malaysia</td>
<td>99.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Mongolia</td>
<td>67.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Myanmar</td>
<td>13.0</td>
<td>43.5</td>
</tr>
<tr>
<td>PDR Laos</td>
<td>55.0</td>
<td>2.8</td>
</tr>
<tr>
<td>Philippines</td>
<td>89.7</td>
<td>9.5</td>
</tr>
<tr>
<td>Singapore</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Thailand</td>
<td>99.3</td>
<td>0.5</td>
</tr>
<tr>
<td>Vietnam</td>
<td>97.6</td>
<td>2.1</td>
</tr>
<tr>
<td>Other Asia</td>
<td>83.4</td>
<td>7.7</td>
</tr>
<tr>
<td><strong>China &amp; East Asia</strong></td>
<td><strong>90.8</strong></td>
<td><strong>186.3</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Electrification rate (%)</th>
<th>Population without electricity (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>15.6</td>
<td>23.8</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>41.0</td>
<td>95.7</td>
</tr>
<tr>
<td>India</td>
<td>66.3</td>
<td>403.7</td>
</tr>
<tr>
<td>Nepal</td>
<td>43.6</td>
<td>16.5</td>
</tr>
<tr>
<td>Pakistan</td>
<td>62.4</td>
<td>68.0</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>76.6</td>
<td>4.7</td>
</tr>
<tr>
<td><strong>South Asia</strong></td>
<td><strong>62.2</strong></td>
<td><strong>612.5</strong></td>
</tr>
<tr>
<td><strong>Developing Asia</strong></td>
<td><strong>78.1</strong></td>
<td><strong>798.7</strong></td>
</tr>
</tbody>
</table>


Electricity has the ability to positively affect lives of people, and is associated with higher literacy rates, better health standards, and higher levels of development. For many rural communities, electricity is considered a high-cost, high-quality energy source outside their reach. Although there are other energy sources and services that are equally costly, electricity falls under a distinctive category due to its identity as a basic need and its role as a developmental vehicle for rural populations (ENERGIA, 2008). In Asia, as we can see from Table 1, there is still a large gap between availability rates of electricity in urban areas (93.9%) and rural areas (68.8%). Moreover, from Table 2, the South Asian region still lags behind in terms of electrification with only 62.2% electrification in the region. The extreme case is of Afghanistan with only 15.6% of electrification of the whole country (IEA, 2010). The rural poor in developing countries still deprive of modern energy supply which is
important for improving their quality of life.

In developing countries, higher marginal costs of supply associated with rural electricity provision, coupled with limited paying capacity of rural consumers, have resulted in rural electrification being a persistent dilemma for national power utilities. This is because national power utilities have conflicting objectives: they have to operate on feasible financial principles for profit-maximisation, whilst also having to respond to social demands by subsidising electricity prices. Rural electrification does ensue, but often slowly (Aguilar 2009b, p.19).

The use of electricity by women in rural areas can help lighten the burden of their traditional tasks and responsibilities while also providing them with new possibilities of income generation. For example, the use of electricity helps to reduce labour in water collection through water pumping, reduce labour in agricultural processing through electrification of rice mills and other food processing facilities, and reduce labour in cooking. The availability of electricity also improves security for women, and their ability to engage in community or educational activities at night with electric lighting. It permits more time for leisure activities such as reading, and watching television. It also allows women more flexibility in performing their tasks, for instance, women can choose to cook in the evening rather than in the day with the use of electric lighting. Studies show that the availability of electricity broadens women’s opportunities for income generation (Cecelski, 2002; ENERGIA, 2006; UNDP and ESMAP, 2004b).

**Micro-Hydel Programme: Rural Electrification in Chitral, Pakistan**

Chitral, a province in a remote area of Pakistan, had benefited greatly after installation of hydropower generators in the communities. Previously, people of Chitral relied on smoky, unreliable pinewood torches and expensive kerosene lamps. In the 1990s, the Aga Khan Rural Support Programme (AKRSP) initiated the ‘Micro-Hydel Programme’ aiming to provide affordable energy sources for rural areas. As Chitral is situated in the region where there are fast-flowing rivers. It has the potential for installing small-scale hydropower generators without the intrusion of gigantic dams. With the participation of communities in Chitral, AKRSP successfully installed 170 micro-hydel units providing electricity for 50% of Chitral population. As a result of electrification, communities in Chitral saved a lot of money from decreased use of kerosene oil and batteries. Electrification gave women of Chitral better opportunities to improve their livelihood, and also helped reduce the burden of household tasks such as washing and ironing clothes. Women switched into using washing machine and changed from using traditional coal-heated iron to electric iron. A Chitralian woman reported that to heat up the coal, she had to blow it which always gave her a headache and it took about half an hour to make the coal hot. But with electric iron, she did not have to do that anymore and it also saved her a lot of time.

Moreover, access of electric lighting increased the production of ‘shu’ (a traditional woolen fabric) and other woolen products such as socks, mufflers and sweaters which women made for their families as well as commercial purposes. Women of Chitral were also responsible for caring for and milking cows in their household and processing milk product. Traditionally, cow’s milk would be put in bag made of sheep or goat skin and was manually shaken for several hours, to make whey or butter. However, this task was replaced by machine. People preferred machine-made whey and butter did not smell of sheep or goat skin. Electricity also alleviated health
problems of women: with lighting, women suffered less from eye problems when weaving and knitting at night; they also suffered less from indoor air pollution as electric lights replace kerosene lamps and pinewood torches. Girls of Chitral received greater benefit, from increasing education and access to information regarding lighting and the use of television; unlike before, they could read at night and receive news and information from the outside world (ENERGIA, 2006).

In short, women disproportionately bear the negative impacts from the use of traditional energy systems, and improvement of energy systems lead to better welfare of women as highlighted above. Therefore, governments should formulate policies that support the efficient dissemination of improved energy systems, and educate women about the adverse consequences of using traditional sources of energy. Although women are the main users and suppliers of energy in their households, they are usually not afforded special attention by energy utilities or people in charge of alternative energy programmes, or adequately involved in decision-making processes. This is because women are frequently regarded as being incapable of dealing with the technicalities of energy processes, resulting in such information only being provided to men as heads of the households. In part, women’s exclusion is based on the ‘gender-blind’ approach: this is the view that everyone benefits from electricity so gender analyses are not even contemplated.

3.5.2. Liquid Biofuels

Biofuel collection still remains a vital source of livelihood for over a billion inhabitants of the Asia Pacific, hence an investigation of its dynamics with regard to gender remains vital. Men and women share in biofuel collection practices, for example, firewood gathering. Care must be taken not to abuse this biofuel collection, from a specific land/area. This could further cause harm (not benefit) to the lives to those dependent on such biofuel. Efforts to preserve natural resources can be interlinked with policies such as the ban on further excavation when a certain limit is reached. However, the implications may differ from anticipated ones. A residential shift caused by seeking proximity to area where biofuels may be collected, can have a simultaneous differing effect on each member of the family, group, or community. Children's education may be effected, the wife's/husband's relatives' houses may be distanced, which may remove social support for the family or community. Social networks may diminish as a circumstance. In such a scenario, harmonious relations between members can create a healthy, beneficial atmosphere. Endangering the sanctity of earth's depleting resources would have a devastating impact not only on people of Asia Pacific, but on the entire world. Thus, these issues demand undivided, and due attention.

Biofuels, in general, refer to solid, liquid or gas fuels derived from biological or organic material, mainly for the purpose of using them as fuels for e.g., vehicles and heating devices (Gonzales, 2008). Some contend that soon the price of certain commodities such as corn will be determined by their value as feedstock for biofuel rather than their importance as human food or livestock feed (Danielsen et al., 2009). According to Danielsen et al. (2009), “Biofuels are a bad deal for forests, wildlife and the climate if they replace tropical rain forests. In fact, they hasten climate change by removing one of the world's most efficient storage tools, intact tropical rain forests”. Danielsen et al. also found that the production and use of palm-oil biofuel from land
that used to be rainforest would lead to greater CO₂ release than would refining and using an energy-equivalent amount of fossil fuel for 75 years. Biofuels which derive from intensive agriculture also increase the loss of biodiversity. The removal of forest reduces diverse species of fauna, sometimes replacing them with fewer non-forest species. (Boonlong et al., 2011; Bosworth et al., 2012). For example, Aratrakorn et al. (2006) point out that oil-palm plantations in Thailand supported fewer bird species than forest and that these species were significantly more widespread and of lower conservation status than those in forest. Furthermore the loss of species was not random: all the forest woodpeckers, barbets and most of the babblers were lost, and there was a greater tendency for larger species to be lost.

While large-scale biofuel plantations seem to spark numbers of debates around deforestation, invasion of indigenous lands, increasing greenhouse gas emission and so on; rural and small-scale biofuel production seems to contribute to people’s empowerment and reduction of pollution in rural areas (ENERGIA, 2009). This situation suggests that policies on biofuel plantations need more research, as well as concrete state regulations to prevent excessive deforestation and unintended increase of greenhouse gas emissions.

As countries strive to meet obligations to reduce carbon emissions under one international agreement (the Kyoto Protocol), they may not only fail to meet their obligations under another (Convention on Biological Diversity) but may actually hasten global climate change (Danielsen et al., 2009). In addition, climate change mitigating policies must consider women’s empowerment and, at the same time, safeguard the natural landscape (rainforests, etc). Scientists say there is an urgent need to support the current rush toward major decisions on biofuel policies in Asia and the Pacific with solid research and unbiased information about biofuel’s potential benefits, impact, and risks.20

Currently, the world is facing an emergency situation with regard to energy and fossil fuels. The global demand for fossil fuels keeps rising, even though they are non-renewable and will eventually be exhausted. So far, considerable efforts have been made to develop alternative fuels with similar properties and performance as the petroleum-based fuels. Of the alternative energy sources, fuels of bio-origin, specifically biodiesels, have been likely to serve as potential replacements of petrodiesel because they are renewable, nontoxic, environmentally safe and biodegradable (Winayanuwattikun et al., 2008).

### 3.5.3. Gender and Liquid Biofuel Production

The aftermath of a rising awareness of the harms inflicted caused by fuel combustion, fumes and uncontrolled carbon dioxide emissions is a trend towards seeking alternatives to petroleum-based fuels. Liquid biofuels offer a ‘greener’ solution. These fuels may not further deplete the ozone layer. Consequently, liquid biofuel production is in the experimentation phase in many parts of the region, although it is not a new phenomenon. Its relative introduction preceded the extensive research and information on the subject, found now. For the Asia Pacific, the region has vast

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renewable resources (enclosed in endless opportunities) as well as non-renewable resources. Iran and Saudi Arabia remain oil-exporting giants, whereas China and Japan are seen on the forefront of discovering newer and better ways to race through technological advancements, alongside focusing on preserving the environment. India, too, has been quoted to denounce previous practices that are not eco-friendly, boasting a shift to greener and eco-friendly solutions. Whereas the role of women in liquid biofuel production and the methodologies hypothesised for the process remains unclear, both males or females play roles in promoting progress in the area.

The recent unprecedented increase of oil prices that brought many countries face-to-face with the ugly nature of the energy crisis, and the growing threat of global warming due to effects of climate change, have driven the world in quest for solutions. One path to energy independence lies in the development of renewable energy technologies and policy, such as those that promote the expansion of bio-fuel production (Marshall, 2009). Producing liquid biofuels can be done using two main approaches: One is to use crops high in sugar or starch, and then use yeast fermentation to produce bioethanol. The other is to use animal fats or plants that contain high amounts of vegetable oil, and let these go through a process of etherification to produce fuels such as biodiesel.21

Liquid biofuels have been debated since 2008, when the sharp increase in food prices was considered by many to be caused by the increased production of this kind of biofuels. There are still many questions though on how quickly second generation biofuels22 may access and penetrate the market. Also, the resource base for those biofuels is different: biomass residues from agriculture and forestry, and lignocellulosic biomass from perennial crops that can not only be produced from arable land, but also from pastures, marginal and degraded lands (IEA, 2007).

The need for measuring indirect emissions and using the results to make sound policy judgments is urgent. As liquid biofuel production spreads around the world, so do its cascading indirect impacts. Many feedstocks require a lot of land for growth. So an increased reliance on biofuels will increase global demand for land to meet both our existing food and fibre (e.g., timber, wood pulp) needs and the new demand for fuel. Such large-scale redistribution of land uses to accommodate liquid biofuel production may result in substantial carbon emissions, particularly if uses such as agriculture or ranching are pushed into high-carbon forests and grasslands. Land-use changes such as these already contribute significantly to climate change, with deforestation and forest degradation accounting for approximately 12-17% of global greenhouse gas emissions, depending on calculation methodology used. Accelerating rates of


22 The distinction of first and second generation biofuel hinges on the feedstock used in production. The first generation biofuels refers to those mainly based on sugars, grains, or seeds, and generally requiring relatively simple processing to produce the fuel. In contrast, second generation biofuels would be generally made from non-edible lignocellulose biomass, including residues of crops or forestry production (corn cobs, rice husks, forest thinning, sawdust, etc.), and whole plant biomass (e.g., energy crops such as switchgrass, poplar and other fast-growing trees and grasses). Biofuels obtained from vegetable oils produced from sources that do not directly compete with crops for high-quality land (e.g., jatropha and microalgae) can also be labeled as second generation biofuels (Carriquiry, 2011).
deforestation could negate any greenhouse gas benefits associated with using liquid biofuel rather than petroleum in cars (Marshall, 2009). As liquid biofuel production increases, counting all the associated greenhouse gas impacts is critical to good energy and climate policy (Marshall, 2009). On the question of why should indirect impacts be included in greenhouse gas accounting for liquid biofuels, Kenneth G. Cassman (2007) points out that, “There is a new urgency to improve the accuracy of predicting climate change impact on crop yields because the balance between food supply and demand is shifting abruptly from surplus to deficit. This reversal is being driven by a rapid rise in petroleum prices and, in response, a massive global expansion of biofuel production from maize, oilseed, and sugar crops”. Assessing the impact of agricultural liquid biofuel production policies on the environment, with the global population growing by 90 million a year, the demand for food and energy is set to intensify. The future of agricultural policy is complicated by the emerging potential of large-scale bio-energy production.23

As a contributor in the global drive in rebuilding a greener, cleaner environment, liquid biofuels can also be part of the solution. Biofuels reduce greenhouse gas emissions.24 Past decades have seen the rapid increase in importing of biomass in countries undergoing industrialization; factors attributed to this increase include introduction of policies for cost-efficient renewable energy use. However there are some concerns for ecological, environmental, and social implications of bioenergy production, and consumption. This concern has been spurred by reports about bioenergy crop production causing deforestation and the associated loss of biodiversity, displacement of forest people and related land conflicts (Wicke et al., 2008). Undesirable effects of bioenergy production have resulted in initiatives to develop such criteria to ascertain ‘sustainable bioenergy trade.’ (Wicke et al., 2008)

From a gender aspect, liquid biofuel production yield both benefits and challenges to women and men in different ways. Lambrou and Rossi (2008) assert that liquid biofuel production might socially and economically marginalise women and female-headed households. The increasing demand for biofuels, together with the demand for lands which are used in liquid biofuel production, might put pressure on ‘marginal’ lands. Marginal lands are perceived as less important and of less ‘use’; they usually are lands that had been cultivated on for several times, so the soil retains little fertility. However, these lands are important to women. For example, in Sub-Saharan Africa, husbands always allocate these low quality lands to their wives. Women use marginal lands to grow crops for household or use them for medicinal and ritual purposes. When these lands are converted for biofuel production, agricultural activities of women might be partially or totally displaced. Women might not be able to provide food for their family. Another impact of conversion of marginal lands is that, women might lose decision-making power in the household as their control over these lands decline. This problem exists because women have no equal rights to land and they are economically vulnerable. Women should have the chance to participate in discussions

about biofuel plantations in their communities and cooperation between men and women should be implemented in order to address the pros and cons of converting lands into biofuel plantations.

Despite such challenges, there are cases which liquid biofuel benefits women in rural areas in small-scale production. Liquid biofuel production can reduce the use of traditional solid biofuel (such as woods and animal dung) in the communities, thus decrease women’s drudgery in gathering woods and also their exposure to air pollution while cooking (ENERGIA, 2009). Production of biofuel by rural communities raises new possibilities for income by growing and processing biofuel crops. In Cambodia, an NGO called ‘Solidarity and Community Development’ (SODECO) worked in development in rural areas by training village women to produce and make use of biofuels to run electric generators instead of using diesel. SODECO started an experiment, the Jatropha oil project, in 2006 with a farmer family from Bot Trang, in Banteay Meanchey province, Mongkolborei district. Jatropha is a local plant which villagers grew as fence. The NGO promoted the benefit of Jatropha plant because oil can be extracted from its seed. Jatropha oil costs only 37% of the price of diesel and helps families to reduce their fuel cost. Moreover, Cambodian farmers normally use a mechanised plow that runs on diesel, so when they walk or sit behind the machine, they inhale dangerous fumes. However, a mechanised plow using vegetable oil emits less pollution and greenhouse gas. The experimenting family also benefitted from Jatropha cake, which is the residue left over after the oil is extracted from the Jatropha seed. Jatropha cake was sold as organic fertilizer to nearby farmers and mushroom growers, as animal feed, and for soap-making. The success of the family led to the village’s interest in growing and making use of Jatropha. It was reported that, in Bot Trang, the majority of those who participated in training programmes related to the production and use of Jatropha oil were women. This kind of rural energy development increases women’s participation in their communities and also raises their income. Women of Bot Trang were also very interested in the opportunity to have access to electricity without having to walk long distances or to spend money buying fuel from outside their farms (ENERGIA, 2009).

3.6. The Coal Mining Industry and Exposure to Gender-Related Risks

Gender Segregation in Employment

Gender division of labour plays a prominent role in determining differential lifestyles of men and women. While women are more likely to engage in domestic activities and informal economy, men tend to perform more in formal economy (ILO, 2002). Men are dominant in occupations that are prone to accidents, injuries and death more than women. Table 4 illustrates the female share of employment in Asia in the formal sector, and we can see that women predominantly work in service and private household sectors. While male workers concentrate in fishing, mining and quarrying, and construction.

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25 Informal economy is generally referred to economic sectors which are not regulated or well-protected such as those who sell and produce goods from their homes; garment makers; embroiderers; incense–stick rollers; cigarette–rollers; paper bag makers ; kite makers ; hair band makers; food processors; street vendors and others (ILO, 2002; 2010).
Table 4: Female share of employment in 21 Asian economies, minimum, maximum and medians.

As suggested in research, men suffer from work-related injuries and diseases more than women (Leigh et al., 1999; Tadesse and Kumie, 2007). As it is the case for women, men also suffer from risks due to gendered-segregated activities. Moreover, they also get negative impacts from expectations to conform masculine behaviour (such as risk-taking, tough, assertive, competitive and so on), in other word, from gender stereotypes.

Men are employed in dangerous industrial sector, such as mining industry, more than women because of assumption (of their masculine behaviour and their greater physical strength) that people in the society make for them and men’s perception of their own gender roles. Nevertheless, gender roles are influenced by socio-economic conditions as well.

In the case of China, Yao (2006) noted that during communist rule, women contributed a large share to mining labour because of communist ideology of equality. In the 1950s to 1960s, women miners were glorified as ‘Iron Girls’. Nevertheless,
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after economic reform in China female employment in mining declined\textsuperscript{26}. This economic transformation from socialist economy to market-based economy, consequently shifted views on women’s labour in the mining sector. From a cost-benefit perspective, female labour was more costly than male labour because of the requirements of maternity leave provision, moreover, women were seen as less reliable than men as well (Yao, 2006)

Many countries in the Asia-Pacific region rely on mining for their main energy supplies. For instance, in China, coal supplies 70\% of energy needs and, according to recent data, the mining industry employs 7 million people\textsuperscript{27}. At present, these countries are not ready to give up such resources even though they have detrimental effects on the environment as well as on workers.

The traditional and stereotypical image of the worker associated with the mining industry is a strong man. This, however, does not detract from the fact that working in these industries means working in very extreme conditions, even with today’s technologies. In China, it is prohibited for women to engage in underground mining according to the “Regulations on Labour Protection for Women Workers”, 1988 (Zhu, 2008).

Accidents and work-related diseases are unfortunately very common within mining sector. Indeed, this industry is said to be careless about safety rules since production and profit are the overriding interests. Literature and news articles particularly pinpoint this lack of safety regulations and ask for change. In the article China mine blast kills 26 and leaves 11 trapped\textsuperscript{28}, Michael Bristow describes the explosion in a coal mine in central Henan province (China) which killed 26 male miners. This is just one instance among many others. The author reminds us that China is the country in the region the most affected by such incidents. More than 2,600 Chinese miners died in 2009 alone, making mining industry in China the most dangerous in the world. Apart from accidents in coal mines, Chinese miners suffer from pneumoconiosis, a lung disease caused by inhalation of dust. It is reported that, in China, there are around 2.7 million miners exposed to dust; 57,000 of them suffer from pneumoconiosis, and 6,000 workers die from this lung disease each year. The death toll of cases by pneumoconiosis is twice as much as the death toll caused by accidents\textsuperscript{29}. According to the International Labour Organization’s (ILO) report on Occupational Safety and Health in Asia and the Pacific\textsuperscript{30}, more than 1.1 million people die from occupational accidents or work-related diseases in Asia and the Pacific every year.

\textsuperscript{26} According to the International Labour Organization (ILO) statistics, in 2000s, exploratory and minerals extraction personnel in China consists of 3,377,670 men and 493,830 women. See Employment for Detailed Occupational Groups by Sex (SEGREGAT). http://laborsta.ilo.org/


\textsuperscript{29} People’s Daily Online. 2010. 57,000 Chinese Coal Miners Suffer from Lung Disease Annually. http://english.peopledaily.com.cn/90001/90782/7196279.html

Nevertheless, recent efforts seemed to have decreased occupational mortality rates. Governments and some organisations are also helping industries in that process. For instance, the ILO works with countries in the Asia-Pacific region “to strengthen national occupational safety and health (OSH) systems, including labor inspections, occupational injury reporting, training and information, and national OSH campaigns” \(^{31}\). In the aforementioned report, the ILO pinpoints the idea that many industries should not be so careless about safety rules because instead of making profits, they lost a lot. Indeed, all the accidents and diseases related to work have both a very bad impact not only on workers but also on productivity, the profitability with repercussion on the whole society. If workers cannot work, neither does the industry. In other terms, the industries have many reasons to change their attitudes towards workers.

China is also setting up new strategies to reduce its mortality rate in mining sector. Michael Bristow \(^{32}\) explains that the Chinese government is already implementing some changes such as the closing of 1,000 illegal pits in order to reduce the risks for workers. He also notes that the mortality rate in mines has fallen to 2,631 in 2009 from 7,000 in 2002. It can be explained by the ongoing governmental efforts to make mines sites a priority. In China introduces mine safety rule, the author Martin Patience \(^{33}\) explains that some industries have hired officials to check whether security regulations are respected.

Although Martin Patience notes the will for change, he also concludes pessimistically, writing that mining industry have high interests and will do whatever they can to break the rules: “But already there have been reports of some managers trying to manipulate the new regulation [...] At one mine, seven workers were given jobs as assistant managers to circumvent the new rule.” \(^{34}\)

### 3.7. Radioactive Substances and Exposure to Gender-Related Risks

Women are especially vulnerable to environmental risks, especially in the case of radioactivity exposure. Proximity to radioactive substance, for pregnant women, for example, may prove harmful, for the fetus as well as the mother. It is not only in the case of employment in facilities with radioactive substance; living near such facilities such as nuclear reprocessing facilities, nuclear storage facilities or even nuclear power plants may also be harmful. Radiation exposure can result from portable x-rays, other diagnostic tests or therapies using radioactive sources or waste; they can provoke mutagenic and teratogenic effects including occupational cancer (Forastieri, n.d.). Ionizing radiations may cause harm to both women and men, due to teratogenic and mutagenic effects; in men, exposure may lead to sterility and mutagenic effects. There is an even greater danger to the fetus as female exposure can have teratogenic and other harmful consequence (Forastieri, n.d.).

Whereas, a greater risk is borne to females, regarding risks of radioactive substance exposure, studies across the region show successive incidents, each year, that prove

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\(^{31}\) Ibid.

\(^{32}\) Bristow, M., *Op., Cit.*

\(^{33}\) Patience, M., *Op., Cit.*

\(^{34}\) Ibid.
fatal to members of either gender. Radioactive substance exposure holds the risk of inducing cancer, or enhancing individuals' susceptibility to acquiring the cancer disease. Investigations upon the probable linkage of radioactive substance exposure and acquiring infectious diseases such as HIV (Human Immuno Deficiency Virus) are under way and propose that the exposure may have further implications, manifold than those already anticipated, or stated in documents highlighting risks of radioactive substance exposure.

In 1992, a large-scaled epidemiological investigation was initiated with support of the Korean Ministry of Education, Science and Technology, to compare the cancer risks between radiation workers and non-radiation workers in nuclear power facilities. Carried out until 2005, a total of 17,648 workers took part in the study, to investigate workplace hazards related to nuclear power generation. With the follow-up lengths averaging 7.53 years for radiation workers, and 6.19 years for non-radiation workers. A total of 99 cancer cases were identified from radiation workers and 104 cancer cases among non-radiation workers. A total of 96 deaths from all causes including cancer were seen in the case of radiation workers, specifically 43 were cancer deaths cause including fatal cases of leukemia. Simultaneously, 79 non-radiation workers were observed to have died from all causes including cancer, and 39 from cancer. Smokers and non-smokers were also observed, and the percentage of current smokers at the time of the study were 54.02% from radiation workers, and 51.21% from non-radiation workers.

More recently, another study was conducted to investigate risk of proximity to nuclear power plants for pregnant women living nearby. The study focused on the case of abnormal pregnancy outcomes. In this ecological research, data were used from the Health Services Birth Reports Database established by the Bureau of Health Promotion, National Department of Health, Taiwan, in 2001–2004 (Wang et al., 2010). Out of the total 5,679 individuals included in the analysis, 90% women had no specific health problems during pregnancy. The researchers concluded that the percentage of variance in the data that could be explained remained low, and the model used to describe premature birth and congenital deficiencies did not fit well. It may well be that more factors than those included in the present study influence abnormal pregnancy outcomes including hereditary factors, maternal environmental effects, and external environmental factors, greatly increasing the complexity and difficulty of the researcher’s task (Wang et al., 2010). They also suggested follow-up studies to focus on fetal deaths during pregnancy, congenital abnormalities in newborns, and also delayed mental development during later childhood and adolescence.

In March 2011, the north-eastern coast of Japan was hit by the tsunami which followed by a magnitude-9 earthquake, sweeping away towns and villages. Fukushima Daiichi nuclear power plant (NPP) which located in the area of the disaster was severely damaged. Initially, the Japanese government announced evacuation of people within approximately 20 kilometres radius and suggested people to stay in their house and close doors and windows to avoid the effects of radiation which came through the air and rain. Subsequently, the radius was expanded and new hot spots continue to be discovered in more distant places.

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35 For classification of workers, see “Dosimetry” section, in Jeong et al., 2010
The effects of this catastrophe are detrimental to all involved: buildings were destroyed, people are killed, injured and displaced, and many lost their livelihood.

The severity of the tsunami and quake still prevails as the result of radiation leakage and its potential damage to people’s lives. Excessive radiation exposure can cause radiation sickness if people are exposed at a certain amount. Even though there was an announcement to evacuate residents who live within 20 km from the NPP, contaminated food with radioactive cesium and iodine are found around Japan. Algae, seafood, milk, green tea, mushrooms, spinach, bamboo shoots and plums – main export foods of Japan, had various levels of radioactive isotope contamination. Radioactive isotope cesium 137 was found in tap water in the city of Tokyo. Japanese officials asked mothers to give their children bottled water and mix their milk formula with bottled water instead of tap water. Consequently, many Japanese consumers turned to bottled water causing a shortage of bottled water in supermarkets. Even though, the level of radioactive isotope lowered to the allowed level as the time passed\textsuperscript{37}, the public continued living with fear of radiation effects in their everyday lives.

There were widespread worries among Japanese mothers and pregnant women who feared that their children as well as unborn babies would be affected by radiation exposure. The Centers for Disease Control and Prevention (CDC)\textsuperscript{38} published “Radiation and Pregnancy: A Fact Sheet for the Public” to help the public understand potential maternal health problems when exposed to radiation, the fact sheet stated that; if the low level of radioactive isotope does not make the mother sick, it can still harm the baby. The risks include stunted growth, deformities, abnormal brain function, or cancer that may develop sometime later in life. CDC also emphasised that “when a fetus is exposed to large doses of radiation (above the dose received from 500 chest x-rays) during the more sensitive stages of development (especially between weeks 8 and 18 of pregnancy), the health consequences can be severe, especially to the brain. Fetuses in the 8- to 18-week stage of pregnancy exposed to the atomic bombs dropped on Hiroshima and Nagasaki were found to have a high rate of brain damage that resulted in lower IQs and even severe mental retardation. They also suffered stunted growth (up to 4% shorter than average people) and an increased risk of other birth defects”.

Although the mother’s abdomen prevents the fetus from direct exposure to most external radiation, the fetus is very sensitive to radiation especially in the first stage of pregnancy. This is called prenatal radiation exposure. It can happen when the mother’s abdomen is exposed to radiation or when radioisotopes are internalised. CDC also addresses that “unborn babies are especially sensitive to the cancer-causing effects of radiation. However, the increased risks depend on the amount of radiation to which the baby was exposed and the amount of time that it was exposed. For example, if the radiation dose to the fetus was roughly equivalent to 500 chest x-rays at one time, the increase in lifetime cancer risk would be less than 2% (above the normal lifetime cancer risk of 40 to 50%)”.


Swallowing or breathing in radioactive materials can also lead these substances into the mother’s bloodstream, which may consequently pass to the babies or the substances can concentrate in the areas near the womb (such as the urinary bladder). In April 2011, after the Fukushima accident, breast milk of four Japanese mothers was found to contain small amount of radioactive iodine.39 Other mothers were also concerned about their breast milk, some did not give their newborn babies their milk because they did not want their children to be exposed to less or no radiation, even though mother’s breast milk is very important for children’s development.

The Fukushima incident caused worries about potential reproductive problems for Japanese people, and in particular, mothers. Responsible of bearing and nursing the children, Japanese women struggled to avoid the effects of radiation to their children. Some have to move to other region of Japan or to other countries away from affected areas to deliver their babies. Parents are more cautious about selecting foods and living everyday lives in fear of contamination. This incident also caused anger and suspicious from the public toward the Japanese government and Tokyo Electric Power Company (TEPCO) for not giving full information about radioactive risks.40 Many people were disappointed that they believed TEPCO and other experts who repeatedly said that Japan’s NPPs were safe and that no accident would ever occur.41 Thousands of people marched after the government loosened safety limits from 1 microsievert (mSv) to 20mSv annual limit, although the long-term impact of low-dose radiation is unknown.42 Not only in Japan, Fukushima disaster sparked debates across many countries whether nuclear power is still an option for energy source.

Many of the clean-up workers in the NPP and outside in the evacuation zone are male, similar to staff in NPPs, because of general concerns of radiation damage to ovaries of women. During the clean-up period after the Fukushima destruction, it is reported that many workers were not properly equipped with safety codes of conduct in order to deal with radioactive environment.43 Some workers did not wear protection masks or waterproof ponchos when it rained, even though radioisotopes might come with rainwater. In this clean-up operation, TEPCO relied heavily on under-educated laborers, who had little knowledge, training or understanding about hazard from radioactive substances. Two workers from Kandenko, the TEPCO affiliate, suffered from more than 100mSv (more than what Japan’s nuclear workers are normally


allowed in five years) after walking in radioactive water. When radiation readings fell to almost normal level, some workers stopped taping their masks to their hoods. Men are more likely to work in high-risk sector, in this case, nuclear power plant clean-up. Given lax safety practices, many of them may suffer from radiation-affected injuries and deaths. At worst, some workers did not know that they would be sent to work at Daiichi where radiation level was extremely high. Some were not properly registered for working in radioactive environment. Moreover, not every worker had dosimeter which would alarm them if radiation exceeds normal level because there were not enough dosimeters in the beginning of clean-up operation.
4. Gender and Climate Change

4.1. Future questions

Questions surrounding climate change remain unsolved as coherent approaches towards reduction of carbon emissions have yet to be agreed upon, and the distribution of financial bearers for addressing climate change have yet to be determined. Critics claim that the 2009 United Nations Climate Change Conference held in Copenhagen failed to formulate a viable solution to the escalating dilemma, citing that although the agreement acknowledged the scientific case for preventing temperature rise by more than two degrees Celsius, there was a lack of binding commitments to reduce emissions in order to reach the desired goal.

A growing series of data has substantiated that recent climate change is mainly a consequence of human activity. Numerous human activities have the ability to influence climate change, including human consumption of resources, the types of energy humans use and produce, and growing population. Additional factors to be considered concerning climate change include age, place of residence, income, and gender. Since 2000, carbon dioxide emissions resulting from human activities, mainly from burning fossil fuels, have been increasing four times faster than in 1990. Natural carbon “sinks” that absorb these emissions, such as oceans, frozen tracts in the Arctic and forests, are unable to cope with the increasing levels of greenhouse gas emissions causing climate change. Climate change may be distinguished from the occurrence of natural inconsistency in weather (droughts, storms and heat waves) in that climate change weather events occur erratically and with greater intensity.

As the growth of population, economies, and consumption rates intensifies and surpasses the earth’s accommodation capacity, climate change could reach unalterable levels, to the point where it instigates migration, disrupts livelihood and development, as well as aggravate disparities between the sexes. Until recently, industrialised countries have been accountable for a large portion of the greenhouse gas emissions that contributed to climate change. Only in 2010 did China become the world’s largest emitter of greenhouse gases. Developing countries have contributed to a smaller portion of greenhouse gas emissions; however, they are more susceptible to the hardships associated with severe weather events, such as intense tropical storms and storm surges, rising sea levels and drought, floods and other climate changes leading to increased food and economic insecurity and health crises.

The Asia and the Pacific is a region that is highly susceptible to hazards concerning climate change. This region itself contains eight countries that are at highest risk of experiencing three or more hazards, out of a total of fifteen countries scattered across the globe. Within Asia and the Pacific, the precincts most prone to climate change effects are low-lying coastal areas, deltaic areas which are often densely populated (such as the Mekong), low-lying small island states (such as those in the Pacific), and semi-arid regions (such as in Central Asia) (The University of Adelaide, et al. 2009, p.15). Climate change has the ability to exacerbate poverty and aggravate the already underprivileged living conditions for vulnerable communities. The livelihood of inhabitants living in regions prone to climate change impacts will be adversely

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44 UNFPA states that 2,000 of Indonesia’s small islands could disappear by 2030 due to rising sea levels.
affected by the irregular availability of resources brought about by climate change. Additionally, they may be at higher risks of falling ill due to exposure to intense heat, atypical cold, infectious diseases and malnourishment (UNFPA 2009, p.3).

4.2. Impacts of Climate Change on Women Living in Poverty

Men and women have adopted distinct roles and responsibilities; this gives rise to disparities in vulnerability of each, as well the ability to face change. Gender may be linked to climate change adaptation in a number of ways – in the form of gender-based division of labour, perhaps, as both perform different jobs/tasks. Climate change plays its role in altering the nature of work, and exposing men and women to different risks as well as opportunities; for example, men might migrate for work, as is often the case in third world, and/or developing countries, whereas women may be forced to spend greater amount of time in collection of fuel or water (UNFPA, 2009). Also, this relationship may be linked with differential access to resources, that imply differences and provision of options, ‘safety nets’ for coping with change.

According to United Nations Population Fund’s (UNFPA) Executive Director Thoraya Ahmed Obaid, “Poor women in poor countries are among the hardest hit by climate change, even though they contributed the least to it”. The research team of Dr Ashbindu Singh, Regional Coordinator of UNEP Division of Early Warning and Assessment, found that in Algiers, “women are 5.4 times more exposed to changes in climatic conditions than men”. Factors that render women more vulnerable than men consist of higher rates of poverty and adult female illiteracy, low-level participation in decision-making, less recognition of their economic productivity, income disparities, and unequal burden in reproduction and domestic responsibilities. Specifically at risk are poor women residing in regions prone to climate change impacts, particularly elderly women, disabled women and indigenous women. For example, an old female farmer, in a poor village, would likely know less about hazards of climate change, than her well-informed affluent urban counterpart. Thus, differences exist, not only in men’s and women’s role in climate change, and vulnerability to it but also within genders. Rural-urban residence, social class, income and education, and minority-majority status all influence climate change vulnerability and ability among subgroups of both men and women.

Fundamental differences between men and women, namely gender-specific roles and resource levels in society, work and domestic life, exert an influence on the vulnerability and aptitude to adjust to the impacts of climate change. Women’s traditional role as providers of food, water and energy for their households fosters a deep dependency on the surrounding natural environment. IPCC’s Fourth Assessment Report on Climate Change (2007) asserted that: “In the developing world in particular; women are disproportionately involved in natural resource-dependent activities, such as agriculture, compared to salaried occupations. As resource-dependent activities are directly dependent on climatic conditions, changes in climate variability projected for future climates are likely to affect women through a variety of mechanisms: directly through water availability, vegetation and fuelwood availability and through health issues relating to vulnerable populations (Adger et al., 2007)”.

Scarcity of resources brought about by climate change means that women will be compelled to spend more time and effort collecting water, food and fuel resources, thus having less time for acquiring development opportunities such as education and income-generating activities.
In addition, as noted above, women are disadvantaged when it comes to property ownership and have limited access to assets and resources, such as land, credit, information, technology, training services and membership in decision-making bodies, the accessibility of which would better equip women to adjust to climate change (Aguilar, 2009a). A person’s susceptibility to risk is reliant upon his or her access to and, especially, control over assets and resources. In other words, those with the least resources will be most vulnerable to the negative impacts of climate change. According to Worldwatch, about 70% of people who live on less than US $1 a day are women. From an agricultural perspective, women have lesser capacity to purchase farming technology, such as watering technology and agricultural devices, to adapt to climate change. For instance in Nepal, an increasing number of rural women have acceded to roles as farmers due to extensive migration by men.

Women are more likely to lose their lives or face more hardship in severe events such as heat waves, hurricanes and tsunamis, with statistics indicating that women and children are 14 times more likely to die than men during natural disasters, further substantiated by the 2004 Asian tsunami in which more than 70% of the dead were women. Of the 140,000 who died from the 1991 cyclone disasters in Bangladesh, 90% were women (Rooke, 2009). Also, at the time of Hurricane Katrina in the United States, in 2005, African-American women were faced with greatest survival obstacles. One justification for higher death rates is biological differences between men and women. Men’s greater body strength may serve as an advantage when fleeing from hazardous scenarios. Another rationale for women’s vulnerability is derived from the implication of social norms (Dankelman 2004, p.46). Many women may be confronted with impediments to their mobility, which in turn reduce their capacity to effectively react to weather calamities, for instance, not being able to relocate without a male relative’s approval, or being unable to perform skills taught to boys such as swimming and tree-climbing. A Bangladeshi woman interviewed by WEDO expressed that a contributing factor to female deaths during times of disaster is that women often attempt to escape whilst bearing household items on one hand, and carrying children in another, leading to significant hindrance to their movement towards safety (Rooke 2009, p.4). Moreover, if women do not have control of income, they may not be able to survive when weather-related disasters interrupt normal life and food availability. This is not to say that men are liberated from the adverse effects of weather events. In some circumstances, men’s lives are threatened because of established gender roles which make it necessary for men to undertake dangerous rescue activities in times of disaster.

Thus, gender disparities are magnified in the aftermaths of natural disasters, such as hurricanes, cyclones, tycoons, floods, droughts, tsunamis, and the like. Rehabilitation and maintenance of the households, as well as emotional rebuilding of ties, in and amongst communities, are basically left to females in that society. Men may be on the lookout for employment opportunities, yet it is women in such circumstances who play vital role in rebuilding communities. Gender norms stand challenged when women take on tasks that are traditionally ascribed to men although this post-disaster phase tends to be short lived. Women also take care of the children and elderly, and in the resulting outcomes of a disaster; this role of women gains all the more importance, as children may be stranded, and the old bereft of their prior support structure.

Hierarchies of many sorts may exist, one of which involves household food hierarchies, where females are placed below the level of males. There is need for
research that explores the course of climate changes, and its manifestation in various regions, and among different socioeconomic and socio-demographic groups, including women and men. How changes are incorporated is also one of the factors depending on the inherent nature of specific societies, and though innovations, care and support may be provided from outside forces; in the end, it is the forces within society which rise to bring about change. As cultures in South Asia and sub-Saharan Africa suggest, the treatment of their women depends on the proximity to a male figure, in the form of marriage. The institution of marriage is exploited to provide for aims of men who see women as nothing but ‘possessions.’ Women have lesser bargaining power in these societies, as well as a demeaning amount of respect from family, and in-laws. Daughters are often regarded to be temporary members of their natal family, and secondary members of their husband’s family (Young, 2006). As widows, their conditions deteriorate further. Women’s opportunities for making an independent living remain low in patriarchal societies (Young, 2006). For instance, women who are compelled to migrate due to climate change may find that gender equality increases as they acquire more financial and social independence, however, there are also occasions in which migrant women are subject to a greater risk of sexual exploitation and labour discrimination. In cases where men migrate, women who are left behind may experience greater liberty in managing the household although their domestic burden may also be amplified: they remain responsible for collecting water and fuel resources despite these resources becoming decreasingly available.

Climate change adaptation may be summarised as – the effort to reduce vulnerability, improve adaptive capacity, and resilience of those whose livelihoods remain dependent upon resources that have close linkage with the climate. For example, adaptation practices in the agricultural sector may change the time of planting or sowing; applying new technologies, and promoting agro-biodiversity (Nelson, 2007). And the process of adaptation is gendered. In what is referred to as ‘autonomous adaptation’, women have undertaken adaptive measures by cultivating new crops, when crops proved unable to withstand certain weather conditions brought about by climate change. Rural women in Meghalaya, India, for example, have switched to cultivating new varieties of cash crops such as turmeric and broom grass that are able to resist irregular and heavier rainfalls. In Nepal’s Terai region, women have altered seed choice and choose to grow crops that can be harvested before flood seasons, and also started cultivating rice varieties that are taller and more resistant to floods (Kelkar, 2009). Variable climatic conditions require progressive adaptation of agricultural techniques by men and as needs and access to resources change. It is thus imperative for governments and agencies to perform their vital role as accurately, in order for maximum reduction in risks to take place. Optimising gains from changing climatic conditions; disseminating agro-meteorological data and tools; conducting vulnerability assessments; and also providing policy reformations to stabilise and strengthen institutional approaches to disaster risk reduction (Kelkar, 2009).

Increasingly, beliefs that the negative consequences of climate change and its mitigation efforts have similar results on both men and women are being acknowledged as incorrect. In particular, women’s coping strategies are obstructed by the prevailing level of gender inequalities. Incorporating gender perspective on climate change brings about new dimension of the problem. It also brings about efforts to tackle the issue of gender inequality in relation to climate change. For example, promoting equality and providing education to poor countries on how both males and females are an integral part of the household; that women also have
economic capacity and that they should have equal opportunity in managing economic resources. Moreover, it is more economically beneficial for a family to have two income earners. Economic strength, in fact, empowers the individual to pursue greater aims; preserving the environment would become a priority, and the knowledge increases would be in geometric progression, rather than in arithmetic progression.

Apart from age-old notions about female's accommodative characteristics; capacity for displaying heights of patience and emotional vigour at times and males', that of superficial amount of physical strength, etc.; men and women may reveal behaviour patterns of, or opposing the usual 'masculine' and 'feminine' norm. The relationship between nature and men, and nature and women, as would be illustrated in case studies and examples from across the region, is misinterpreted at best. It is of utmost importance to highlight such differences; fulfilling an objective of focusing upon further adaptive practices, and hence formation of policies that would secure each gender from probable environmental hazards.

A multifaceted/multidisciplinary approach iconizing gender, its degrees of susceptibility to varying environments and social networks, is to be adopted. Attitudes toward gender and nature linkage show a lack of in-depth study into roles nature and gender play. On a similar note, it is also important for us to gauge on a strict scale, the amount we 'take' away from our environment. Both males and females, in unison, must play their roles well if a sustainable environment is to be created, for the livelihood of future generations as well. In the quest of making life easier and comfortable, perhaps we have gone too far and have actually transgressed the limits which now makes our life more and more difficult, even threatening: like global warming, damage to the ozone layer, mass scale production of unhealthy food and toxic waste disposal, etc. (Khan, 2010).

4.3. Gender and Climate Change-Related Disasters

As mentioned, Women are more likely to be victims of climate change-related disasters. Gender discrimination in some societies causes more death of women than men. For instance, in the incident of 1991 cyclone in Bangladesh, a father grabbed both his son and daughter’s hands to help them from being swept away by the tidal surge. Unable to help both of his children, he decided to let go his daughter’s hand because, according to the father, “(this) son has to carry on the family line” (Neumeyer and Plümper 2007, p. 555). Demographic trends also suggest that women are increasingly at risk. Longer life expectancy means an older and more feminised population that is more likely to experience restricted mobility. There is an increasing number of women who are now living alone or as heads of households; these women are often left in poverty or marginalised by the society as well (Enarson, 2000). And poor women are more likely to suffer negative impact after natural disasters.

Women bear more negative impacts and burden after natural disasters, especially those who are in poverty. Because women are expected to adopt roles of homemaker and care giver for their family, women’s activities are mostly done around domestic sphere. One of the reasons why women make up the majority of disaster victims is that they cannot hear the warning from outside, while men who are working outside can observe the warning earlier and can quickly escape from the disasters. Furthermore, due to illiteracy and lack of access to information, some women do not understand disaster alarms so they cannot survive from the destructions (UNESCAP,
In many developing countries women are main suppliers of water and fuel for their household. Climate change influences the condition of natural resources. As in the case of drought, women in some areas have to walk further the search for clean water. Also, forest degradation affected by climate change causes women to walk longer distance and take more time to find wood or food from more abundant sources. Moreover, as natural resources get scarcer during and after disasters, some girls are forced to resign from school to help provide water or fuel for their family members (Denton 2002, p. 15). Status of women and girls are, in many cases, lowered after disasters. For example, in Cuddalore, India after 2004 tsunami; girls are forced to marry within their extended families without their consent. Women may also be encouraged to bear more children after natural disasters to compensate the lost lives. These conditions restrict women from appropriate education or earning income independently (Oxfam, 2005).

Ikeda (2009) suggests that during flood in Bangladesh in 1994, women and men expressed worries on different issues according to their gender roles. Most village women are concerned more about maintaining their domestic responsibilities such as securing shelter, food and drinking water. However, men were more worried about the issues of income and transportations (Ikeda 2009, p.71). In the same way, Terry Cannon (2002) shows that Bangladeshi women’s economic livelihood was greatly undermined by the flood because of the loss of their utensils and other equipments using in domestic activities. Therefore, women have to work harder when they are attacked by natural catastrophes. Some pregnant women still do the same task of collecting food and water in the time of natural distress. Bearing more responsibility in reproductive and caring work; women tend to attempt to secure lives of their children and older family member when disaster comes, which hinders them to escape safely from disaster.

Due to deprivation of economic resources, women deal with difficulties in recovery after natural disasters. Economically, poor women lack access to economic resources and ownership of working tools or land. Therefore, they can hardly earn money by selling these things in the time of emergency (Dankelman 2010, p. 63). Poor women from female-headed households are in very vulnerable position especially when disasters happen; these women have little resources to support and recovery themselves and their family after disaster. Where women’s role is confined in domestic sphere, it is hard for them to find work outside in order to financially support their family, while it is easier for men to be employed during and after disaster. For example, after the Pacific tsunami hit in 2009, women in the affected islands who work in tourism such as resorts were unemployed after the resort was destroyed, while men were hired for post-disaster constructions (Alston, 2010). Elaine Enarson (2000) suggests seven major economic impacts on women after disasters, which are:

1. Women lose productive assets

Women who are self-employed and homeworkers lose workplace and supplies in disasters. Women farmers lose food security and household power when disasters destroy their land, seed and livestock. Women who are lack of ownership of land might be forced out of their workspace.
2. Women become sole earners

When land, livestock and tools are lost, women and men have to earn income to replace these lost materials. However, women are more dependent than men in terms of care responsibilities which make them less mobile than men and less able to migrate outside the impacted area to earn income. Therefore, women rely more on their own economic resources after disasters hit and they are more affected by poverty than their male counterparts.

3. Women lose entitlements

When women’s resources decrease, they have less bargaining power in the household. They earn less income and often are less mobile than men.

4. Self-employed women lose work

Street vending and other informal-sector enterprises which are small-scale, undercapitalised and insecure often fail. Many of these are run by women. These enterprises lose clients, workspace and supplies when tremendous disasters wipe out their infrastructure. Sometimes the damage is so great that it takes a lot of time to rebuild and recover these enterprises.

5. Women lose jobs and work time

Women are typically slower than men to return to their jobs. Women are needed more than ever to take care of their families in the time of calamity. They may be unemployed for long periods when public-sector buildings are destroyed while men are hired to do reconstruction work.

6. Gender barriers limit women’s relief and reconstruction work

As mentioned earlier, men are more likely to be employed in the post-destruction period. This is because gender roles stereotypes prevent women from doing certain work thus deprive them of their economic opportunities.

7. Gender role changes

As a result of natural disasters, gender roles might temporarily change, but the gendered division of labour may also become more powerful. For example, after Hurricane Mitch hit Central America in 1998, women are found to do traditional “male” work such as digging wells and constructing latrines. However, women still had to be responsible for reproductive work and taking care of children, elderly and the sick.

Climate change causes water shortages which not only affect women in economically terms but also sanitation and health. Rivers that are polluted with agricultural and industrial waste cause sickness to women who rely very much on natural sources of water. Women who are responsible for fetching water might contract water-borne diseases such as cholera, dysentery and diarrhea (Denton 2002, pp.14-5). During flood, when women are experiencing malnutrition and stay in the water for a long time, they are at risk to be infected by leucorrhea which causes heavy discharge from and inflammation of the vagina (Ikeda 2009, p. 72).

In societies where boys are given more favour than girls, discriminatory food provision in family occurs. According to customs in some parts of the world, women have to give food to husband and children before themselves. In Bangladesh, women of all ages are more calorie-deficient than men. Consequently, malnutrition is one of
the key factors that reduce women’s capability in coping with natural disasters (Cannon 2002, p. 48). Malnutrition also makes women more vulnerable to infectious diseases as mentioned above. In the aftermath of disaster, it is found in some areas that relief efforts are more favourable to men. Women face discriminatory relief practices in distributing food supplies after disaster (Neumeyer and Plümper 2007, p. 555).

Natural disasters force people to migrate from their own home. People who are affected by natural disasters move to public shelter or to their relatives’ home. According to UNFPA (2009), the total number of those who suffer from climate-related natural disasters has tripled over the past decade, with an average of 211 million people directly affected each year.

In the flood of 1994, Bangladeshi women expressed their hardship while moving out from their homes. Some say that they had to be in charge of moving all cooking equipment to the relief shelter. Some with unmarried daughters expressed concern of living in shelter with other male strangers. Ikeda points out that some flood shelters were not used by women at all because they felt unfamiliar and insecure with the atmosphere inside the shelter (Ikeda 2009, p.71). Women who were displaced into relief camps faced many difficulties. As in the case of Sri Lanka after tsunami in 2004, it was found that women did not receive equal access to emergency assistance, such as ration cards, which are registered under the husband’s name. Moreover, when people lose appropriate accommodation and other proper infrastructures during disasters, they become more vulnerable since there is no protection from danger outside. For instance, some women were sexually assaulted in poorly lit temporary toilets. Therefore, appropriate lighting, security, and screens to ensure women’s privacy must be provided to protect women and girls (Oxfam, 2005).

It is generally agreed that the poorest, most vulnerable countries are most at risk from climate change and that the small island states of the Pacific are amongst the most vulnerable. People who live on the Pacific island are the ones that are in very vulnerable position when it comes to climate change. They are exposed to the danger of rising sea level, extreme weather events especially because their lives are dependent to agriculture and fishing. They also face rising land and sea temperatures, increased droughts and floods (Alston, 2010). Unlike rich people who have more resources to cope with natural disasters, some poor people have to remain in the areas that are prone to disaster with no choice.

For example, Oreba Obiin’s home is situated on the low-lying coastal Tarawa in Kiribati, a nation comprised of 33 small coral islands in the middle of Pacific Ocean. Throughout her life Oreba can notice a change in sea level: “The water is rising”, she said. She and her husband had to add sand in the floor level of the house to keep it dry. Their roof was very high when they first built the house, but because of rising sea levels, the roof is getting closer to them and soon their heads might touch it. Living on islets, people of Kiribati have limited capacity to adapt with the impacts of climate change. If the sea level keeps rising, their nation will sink into the sea and finally they have to move to other countries. “If we relocate to another country, of course we would lose some of the culture. But if we don’t, we would lose the entire nation and our people. It’s not a choice, it’s a necessity”, Oreba said (UNFPA 2009, p.30).

In other parts of the world, women, children and elderly are likely to stay behind when younger male members leave home; causing women to bear more economic and caring responsibilities to fend for themselves and other dependents. Women and girls
sometimes face gender-based violence, human trafficking, child abuse and alcohol-related abuse while they are on the move (UNFPA 2009, pp.35-6).

Women are often overlooked in terms of their capacity to mitigate the impacts of climate change. They are usually seen as passive agent in decision-making process and are under-represented in governing bodies of local communities. Women are potential agent of change and oftentimes contribute to mitigation of climate change impacts and reconstruction in post-disaster period. As a matter of fact, they play prominent role in climate change mitigation. In developed countries such as Sweden, women use more fuel-sufficient transportation and hold higher share of public transport use. Generally, in terms of agriculture, while both women and men would prefer labour-saving mechanized agriculture, men are responsible for irrigation and women are usually involved in a very labour-intensive, low-emission subsistence agriculture (Lambrou and Piana, 2006). As women hold major responsibilities in households, they have more concrete step than men to protect possessions when there is natural calamity. They also volunteer more in neighbourhood and school education and preparedness programmes and participate in debris removal, clean up and household repairs to help restore homes and neighbourhoods after disaster (Enarson 2000, p.16).

Women are not only victims of natural disasters but they can be agents of change if they are given the opportunity to do so. After cyclone in India in 1991, women in village of Srirampur, Orissa, expressed their voices in local meeting despite the fact that they hardly interacted with other outsiders before the cyclone. Women came out because relief packages from NGOs and government targeted at or through women. Consequently, they are motivated to participate in discussions concerning their interest and other social issues which concerning them. Also, their self-esteem and their societal status increased by joining in these public discussions (UNESCAP 2010, p.11).

In their professional development or in their domestic activities, women frequently are in better position to notice certain change in environment. They are aware of pattern of sickness of children in the neighbourhood and can detect changes in the water when they wash clothes or strange smell in the ground where their children play (Carvajal-Escobar et al. 2008, p.278). Highlighting importance of women, UNFPA (2009) stated that “marginalisation of and discrimination against women and the lack of attention to the ways gender inequality hampers development, health, equity and overall human well-being all undermine all undermine countries’ resilience to climate change.” Although women are among the most affected people in natural disasters, generalising them as ‘vulnerable’ or ‘victims’ may lead to danger. Fulu (2007) points out that, post-disaster responses which focus mainly on vulnerability of women actually serve to increase and reinforce their trauma because sometimes the view of women as victims excluded them from leadership and decision-making roles. Fulu also adds that the emphasis on women’s vulnerable renders men’s experience of powerlessness invisible. It is important to note that gender is not only women’s issue but it is an issue of relations of power and powerlessness. For example, after 2004 tsunami, Maldivian men seemed to be more mentally stressed because they felt that they were unable to fulfill their proper ‘male’ role of securing their families’ needs. Men may also be more susceptible to long-term psychological issues. In many social contexts, it is less acceptable for men to express their suppress emotions after extreme events and they often have less access to support structures which are available for women such
as care provision (Fulu 2007, p.855).

Gender variables must be incorporated policy-making and disaster management. The different impact of natural disaster on women and men must be highlighted; in order to fulfil their differentiated needs. Lambrou and Piana (2006) suggest that countries with gender equity have better environment outcomes. This is because women depend on resources in the community such as forests and waterways for subsistence needs, therefore the preservation of these resources are crucial to their survival. For these reasons, women’s empowerment is the key factor to increase their capacity to handle and adapt themselves in extreme events. Girls must be given education because it is important in order to be prepared for disasters; people cannot understand warning system because they are not educated and do not have enough access to information. Not surprising, those who are uneducated are mostly girls. Shift in traditional division of labour should be taken into account to grant women abilities to participate in public decision making processes and make their voices heard. Cultural norms shift is equally crucial in allowing women to own land and other assets so they can engage in economic activities and earn money, therefore rely less on their male counterparts. Furthermore, women’s specific needs should be fulfilled. In the time of disasters, many of them encounter reproductive health problems, human rights violation and many forms of violence. Women who experience sex-based violence, not only suffer from loss of livelihood after disaster, but might also be subject to HIV/AIDS, other sexual transmitted diseases and unwanted pregnancy. Violence against women bars them from sustaining their livelihoods, reduces their ability to respond effectively to change and limits their autonomy and input to decision-making. Disasters severely destabilise people’s lives, loss of homes and livelihoods. These events exacerbate violence against women (Alston 2010, p.23). Oxfam (2005) reported that domestic abuses in Sri Lanka increased after tsunami in 2004. Additional stress on families from the catastrophe is the reason; one of dominant problems is alcohol abuses which is the key factor that increases the risk of women being assaulted by their partners or other male relatives. Women who survive from disasters might be encouraged to marry earlier than in the past, with implications for their livelihoods, and reproductive health. Moreover, survivor women may be encouraged to have more children to replace those lost in disasters. Consequently, this affects their reproductive health and their freedom to make a living.

4.4. International Instruments on Gender and Climate Change and Environmental Preservation

In accentuating the susceptible positions of women in relation to climate change, it should be emphasised that women’s role in sustaining households and communities is linked to their capacity to mitigate and adapt to climate change. Women occupy leadership roles in managing natural resources, and are in some aspects, more skilled than men in managing water, forests and other components of biodiversity. Their experiences in environmental management allow them to positively assist in determining suitable mitigation and adaptation strategies to combat climate change, hence it is essential for international instruments to pave the way for women to be given an opportunity to play a part in contributing to such strategies, and for their perceptions to be equally represented.

Numerous directives have insisted that the gender approach be assimilated into the various fields of development, but such an approach is deficient within international
climate change policies. Current global initiatives on climate change chiefly emphasise the reduction of greenhouse gases via the implementation of the UNFCCC, the Kyoto Protocol and other similar instruments, and to a considerable extent does not give weight to gender dimensions in adaptation and mitigation strategies (UNDP 2009, p.51).

The Earth Summit of 1992, which aimed to achieve sustainable development and to address problems of environment protection, eventually resulted in the signing of the subsequent agreements including Agenda 21, the Rio Declaration, the UN Convention on Biodiversity (CBD), the UN Framework Convention on Climate Change (UNFCCC), and the UN Convention to Combat Desertification (UNCCD).

The goal of the UNFCCC is to reduce global warming and to counter its effects. Within the text of the UNFCCC, the word ‘gender’ is not mentioned, and neither is reference to women’s participation in climate change. The absence of reference to gender issues also applies to the Kyoto Protocol, which constitutes an addition to the UNFCCC. Nevertheless, the linkage between gender and climate change was formally recognised in the UNFCCC in 2008, during the 14th Conference of the Parties in Poznan, Poland, when it was acknowledged that “the gender dimension of climate change and its impacts are likely to affect men and women differently”. In addition, the secretariat encouraged the creation of gender inclusive policies to be directed towards climate change. It emphasised that women are to be perceived as agents of change, and are thus salient to the implementation of mitigation and adaptation strategies (UNFPA 2009, p.6).

Excluding the UNFCCC, there are numerous international commitments that recognise the linkage between gender equality and climate change. Within these instruments are several provisions pertaining to women’s positions and roles in environmental preservation, and recommendation for their inclusion in environmental management and climate change strategies. In particular, the CBD, with its objective of promoting the sustainable use of biodiversity, clearly incorporates gender specific language within its text by providing for women’s participation. Paragraph 13 of the CBD notes the importance of women’s participation in achieving its objective. This paragraph states: “Recognize the vital role that women play in the conservation and sustainable use of biological diversity, emphasizing the need for the full participation of women at all levels of policymaking and implementation for biological diversity conservation […].”45 Similarly, the UNCCD, with the aim of dealing with land degradation and desertification, not only expressly acknowledges women’s role in rural subsistence but also encourages equal participation of women and men. Article 5(d) of the UNCCD stresses on the facilitation of participation of women in order to counter desertification and to mitigate drought effects.46

The Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) is another instrument that indicates the importance of including women in climate change strategies. It is a pivotal instrument upon which gender advocates can depend on to drive the implementation of climate change policies that are gender-sensitive because parties are legally bound. The CEDAW Committee in the 44th session of 2009 articulated its concern as to the lack of gender standpoints in the

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UNFCCC and other similar initiatives on climate change. The Committee called for all stakeholders to ensure that measures employed against climate change are gender responsive, and issued a statement indicating that “women’s right to participate at all levels of decision-making must be guaranteed in climate change policies and programmes”.47

In addition, the Beijing Declaration and Platform for Action focuses on women’s empowerment by eliminating impediments to women’s participation in public and private spheres through an impartial share in economic, social, cultural and political decision-making. Specifically, paragraph 246 of Beijing Declaration and Platform for Action 1995 expresses that human activities harmful to the environment are destroying natural resources and subsequently depriving women of productive activities, whilst adding to their unremunerated work, further stipulating that women have an important role in achieving sustainable development and in the management of natural resources (International Indigenous Women’s Forum Declaration, 2005).

The international instruments aforementioned make specific reference to the roles women play in environmental conservation and in achieving sustainable development. In particular, these instruments acknowledge the need for women to actively participate in decision-making concerning environmental issues and the need for an incorporation of gender perspectives in sustainable development policies, factors that are essential for mitigating the causes of climate change and adapting to extreme climate events.

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5. Conclusion and Policy Options

Referring to challenges in gender equality in the Asia Pacific region, the situation varies from country to country, region to region, and culture to culture, and the challenges in promoting gender equality are manifold. In most cases, gender biases are forms of gender discrimination happen unintentionally and subconsciously. This is because gender is a socially constructed role and is an intrinsic part of one's value and belief system which is shaped by tradition and culture. As such, gender bias and stereotypes are hard to completely eliminate. A large proportion of women in Asia-Pacific remain excluded from community decision-making, mainly due to the infliction of various social and cultural norms that more or less limit women's roles to domestic and informal realms. This in turn leads to adverse effects concerning their positions in society, and in this case, diminishes their potential to effectively participate within energy and environmental sectors.

The status of women can be elevated, but it first must be recognised that the initial step to progress in any sphere of society's development, is the acceptance that change needs, to occur (UNESCO, 2010). Change must be followed by a rigorous analysis, a quantitative and qualitative, impartial and unprejudiced investigation, with the motivation of achieving a profound improvement. Women’s position in society can be improved by encouraging greater female independence through the appropriation of skills, increased income across informal and formal work spheres, and increased influence in decision-making. Nussbaum (2000) described the 'capabilities approach', as ‘an approach to the priorities of development that focuses not on preference-satisfaction but on what people are actually able to do and to be’ (UNESCO, 2010).

Such an approach may be adopted to harmonise gender and development processes, and empower women at the next level. The idea that freedom is more than citizen’s rights on paper, is central to the capabilities approach. This approach may have the potential for enabling and empowering poor rural women; increasing independence, self-sufficiency, and economic participation in the household. This empowerment can also lead to feelings of self-reliance and contentment, which in turn may create harmony within gender relations in household, and contribute to lesser environmental degradation. Furthermore, the various aspects of women’s earning power, economic role outside the family, literacy and education, property rights and so on may seem rather diverse and disparate, yet share the positive contribution in giving women a voice, increasing independence and empowerment (UNESCO, 2010).

Governments have an important role in establishing gender-sensitive policies, as well as a paradigm for improving the current frameworks concerned with the development of services. They should formulate effectual arrangements with the organisations involved in the implementation of such services, such as state organisations, NGOs, major corporations, or small private traders. National institutional frameworks on gender must also be established so as to ensure the security of rights, needs, roles, responsibilities of both genders. Programmes like ‘land literacy’ programme have been initiates by governments, for example, and ‘People’s Resource Mapping Program’, where local villages map their local resources (UNESCO, 2010). Such community maps are, thereafter, combined with scientific maps in order to guide environmental and social planning, with the inclusion and participation of villagers, such that they take part in implementing the decision.
Energy and environment policies must also be in synchronisation with other types of policies dealing with employment, education, health, agriculture, social security and the like. Energy planning must be decentralised so that rural men and women are able to engage in planning and implementation. Furthermore, policy-makers need to acknowledge the gender bias present in energy services, and recognise the differences between men’s and women’s level of access to energy. Energy planning that is gender-neutral often results in energy services that do not benefit women to the full potential. Strategies that are able to improve the position of men will not necessarily have similar results on women. What is required is an engendered energy policy that is sensitive to the different energy needs between men and women. Women’s roles as energy providers expose them to greater negative impacts stemming from the use of traditional energy systems, particularly in the form of indoor air pollution, as well as the infliction of injuries from the laborious activity of fuel-collection. Rural energy development strategies need to focus on women’s priorities to save time and labour, and to improve health and security, in order to benefit them. It is also important that policies consider class distinctions among women as well as men. They must promote increased economic self-reliance for people living in poverty to increase economic self-reliance. Most income-generating activities that poor women are engaged in are based on human labour. In order to reduce labour force and other negative effects emanate from inefficient energy use, policies must promote efficient and sustainable forms of energy (Ramani and Heijndermans 2003, p.14), especially in rural areas.

The success of engendered energy and environment practices is determined by the effectiveness of policy formulation and implementation. Both policy formulation and implementation need to be engendered to achieve an effective energy policy that is gender-sensitive. Incorporating an increased proportion of women in decision-making positions in energy and environmental sectors can help to promote gender as a vital component of policies and practices, and offer resolutions from a female approach. Currently, professional positions relating to policy formulation and implementation are chiefly occupied by men, thus most solutions are presented from a male perspective. Female staff also should be employed to better communicate with women respondents with regard to development programmes, and to overcome certain cultural constraints concerning female mobility. Lessons can be derived from cases that show women as competent advocates in preserving the environment and/or contributing to the circumvention of climate change, such as the Chipko movement, the Barefoot Solar Engineers and the Char Montaz Project (discussed in chapter 3).

The concepts concerning gender frequently recommended by development agencies actually stem from two paradigms, the first being the Gender Roles Framework (also called the Harvard Analytical Method or Gender Analysis Framework), and the second being the Development Planning Unit model. The first framework introduced the notion that influencing factors must be separated and considered on a different plane when integrating a gender perspective in planning development projects. Such factors consist of work roles, time input on tasks, access to resources, control over resources and benefit. The second framework proposes similar notions, but further stresses the concept of gender-practical needs, which refer to what women require to improve their daily lives, as well as the concept of strategic interests, which refer to what is required to alter their social positions. These two frameworks currently form the foundation upon which gender approaches lie (Skutsch 2005, pp.38-9). But the economic empowerment paradigm has been gaining traction in the field of development, with both the World Bank and USAID adopting such an approach over the last few years. This approach was discussed in chapter 1.
One weakness is the lack of accurate gender disaggregated data, which is important for imposing gender-responsive policies. The different energy needs of men and women must be portrayed through gender disaggregated data, meaning data that is separated based on sex, as well as data disaggregated by other social and economic factors. Disaggregated data allows analysts to better comprehend complex associations between gender and the practical components of energy use. The disaggregated approach has been utilised by many developing countries, including Mexico, India and China, in which success has been achieved to varying extents. A common challenge with disaggregated data faced by many developing countries is that the data obtained is often insufficiently detailed or precise (Vera and Abdalla. 2005, p.159).

As to the issue of climate change, the fact that it has different effects on women and men serves as a key piece of information for governments in their tasks of formulating policies to mitigate or adapt to climate change. Climate change strategies should recognise that women are influential agents of change, and possessors of useful knowledge and skills concerning mitigation and adaptation to climate change. Although women have started taking on roles as important advocates in countering climate change, the involvement of women in planning and decision-making remains inadequate. A high level of dedication and effort by policy-makers is required to alter the situation, so as to eliminate discriminatory standards against women and to equally engage them in development (Aguilar 2009b, p. 45).

Policy-makers should take note of women's ability to become effective agents of change and incorporate women's efforts into mitigation and adaptive strategies. To do so, women must first gain secured access to natural resources so that an incentive exists for them to devote an effort to such strategies. Climate change strategies should also reflect the need to expand women’s assets, as well as focus on increasing women’s capacity to cope with risks by implementing ways to improve women’s access to education, technology, skills, health care services and financial mechanisms. Rural and indigenous women in South Asia have expressed the desire for the following services to better sustain their livelihoods:

- Flood-protected shelters for storing harvest and livestock during floods or unpredicted rainfall periods;
- Training on capacity-building and dissemination of knowledge on adaptation strategies and livelihood options;
- Greater access to healthcare, education and financial services; and
- Secure rights to land and resources.

In terms of the types of mechanisms that could be incorporated within strategies for climate change, a guideline can be derived from UNFCCC’s National Adaptation Programmes of Action (NAPA), which is a process uniquely formulated to assist the world’s least developed countries with climate change impacts. NAPAs constitute a channel for least developed countries to assess address their adaptation needs (UNFCCC, 2010). The preparation and execution of NAPA is mainly funded by Least Developed Countries Fund (LCDF) of the UNFCCC, which is in turn supervised by
the Global Environment Facility. Since 2009, 42 Least Developing Countries (LDCs), out of 49, have presented their NAPAs to the UNFCCC. NAPA guidelines acknowledge that the impacts of climate change are gender-specific, and that women bear traditional knowledge on sustainable practices and adaptation tactics. Commendable models of NAPA that demonstrate engendering practices include those of Bangladesh, Malawi, Mauritania, Niger, Senegal and Sierra Leone. Bangladesh’s NAPA listed gender equality as a component for determining activities, as well as involved indigenous women in the process. Other NAPAs have incorporated similar engendering practices pertaining to a gender approach. As most NAPAs have yet to reach the implementation stage, there is still room left to influence the procedure so as to better ensure that gender is mainstreamed (Rooke 2009, p. 28).

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48 The Global Environment Facility is an independent financial organization that provides grants to developing countries and countries for projects that benefit the global environment and promote sustainable livelihoods in local communities.
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